STUDENTS HANDBOOK
B.SC COMPUTER SCIENCE
2023

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Foreword

Welcome to a world of endless possibilities at West Midlands Open University, where dreams become realities. We are Nigeria's pioneering private open university, with a clear purpose to prepare people for opportunities and to improve society through education. We are a vibrant academic community that believes in the power of education to transform lives and cultivate a brighter future. We are digital, and we use appropriate technologies to drive our operations and processes. We are committed to your personal growth and nurturing your potential to become a positive agent of change in the world.

Our university is deeply rooted in the principal values of empathy, truthfulness, and innovation. These values guide our actions, shape our culture, and drive us to create a better society using the programmes in our various schools. We encourage you to imbibe these values as you study at West Midlands, use the computing, managerial, social, and soft skills you would gain in any of our departments to make the world a better place.

This handbook is a comprehensive guide that will serve as your compass throughout your journey with us. It contains all the course information you will need in your department and provides an all-inclusive course description, learning outcomes, mode of assessment, grading system, rules, and regulations for all the courses you will study. Please consult the handbook for all your academic decisions. It is a valuable resource that will help you succeed in your studies. If you have any questions or concerns, please do not hesitate to reach out to your Head of Department and the Student Success Advisors. They would be happy to assist you. We are here to support you all the way.

As an open university, we are committed to academic excellence, an excellent student experience, accessibility, inclusivity, affordability, flexibility, and a strong partnership in education. We require you to pursue your studies with dedication and stay true to these commitments. Remember that quality is our watchword, and your success as an outstanding graduate is our priority.

Congratulations!

Professor Olumide Babatope Longe

Vice Chancellor

Vision of the University

Become the most trusted tertiary education institution through world-class digital learning services and the efficacy of outcomes.

Mission Statement

To offer access to a wide range of flexible, affordable, and qualitative academic programmes that empower individuals with the skills they need to thrive in today's world.

Philosophy of the University

Our philosophy at West Midlands Open University is based on:

Diversity: West Midlands Open University is committed to creating a diverse and inclusive community where everyone feels welcome and respected. We believe that diversity is essential for innovation and excellence. We value the unique perspectives and experiences of our students, faculty, and staff. We are committed to creating a culture where everyone feels comfortable sharing their ideas and participating in the learning process.

Cultural awareness and respect: We believe that cultural awareness and respect are essential for a successful learning environment. We encourage our students, faculty, and staff to learn about and appreciate different cultures. We strive to create a culture where everyone feels safe and respected, regardless of their cultural background.

High standard professional behavior: We expect our students, faculty, and staff to uphold the highest standards of professional behavior. This means being respectful of others, being honest and ethical, and being committed to excellence. We believe that high standards of professional behavior are essential for creating a positive learning environment and for preparing students for success in the workplace.

Intellectual curiosity and pursuit of knowledge: West Midlands Open University is committed to fostering intellectual curiosity and the pursuit of knowledge. We encourage our students, faculty, and staff to ask questions, to challenge the status quo, and to explore new ideas. We believe that intellectual curiosity and the pursuit of knowledge are essential for innovation and for solving the challenges of the 21st century.

Discipline: We believe that discipline is essential for a successful learning environment. We expect our students, faculty, and staff to be disciplined in their work and studies. This means being punctual, being prepared, and meeting deadlines. We believe that discipline is essential for developing the habits of mind necessary for lifelong learning and success.

Objectives of the University

The objectives of West Midlands Open University are:

1. Accessible education of the highest standard, this goal consists of using modern technology to enhance learning experience and to make education accessible to a teeming population of Nigerians and anyone else desirous of quality education;

2. Creation of enduring values in our learners, this goal encompasses stimulating awareness of cultural values, respect for others, lifelong thirst for knowledge, and passion for excellence, all of which will be achieved through our well-rounded world-class teaching and learning materials; and

3. The production of socially responsible and leadership-oriented graduates, this goal includes encouraging a spirit of independence, pragmatism and innovativeness in our learners.

Our Purpose

Equipping individuals for opportunities and enhancing society through education.

Core Values

Our unwavering commitment to excellence, innovation, social responsibility, collaboration, and continuous improvement propels us toward building a better world.

Motto of the University

Integrity, Leadership and Service

Preface

The world is becoming increasingly automated and artificial intelligence is playing an increasingly important role in our lives. Computer science is the foundation of these technologies, and its principles are used in almost every job today.

The Computer Science Department at West Midlands Open University is committed to producing job-ready graduates who are innovative and truthful. Our curriculum is designed to give students a strong foundation in theoretical computer science with practical applications that can be used to solve local problems and make global contributions to the field of computing.

This is the first edition of the Department's handbook. It follows the National Universities Commission's Minimum Academic Standards (NUC) in line with the Core Curriculum Minimum Academic Standards (CCMAS). This handbook is intended to serve as a guide for our students. It also provides clear objectives and learning outcomes for our courses leading to the Bachelor of Science degrees in Computer Science, Data Science, Cybersecurity, and Information Systems. The handbook also includes information about the Department's administration, graduation requirements, rules and regulations for course registration, course listings, and detailed individual course descriptions.

On behalf of the Computer Science Department, I welcome you to the field of computing and congratulate you on your admission to one of the most relevant degree programs of the millennium.

Prof. Baale Abimbola
Head of Department,
Department of Computing

1.0 About the Programme

The Bachelor of Science in Computer Science is an innovative, all-encompassing program meticulously crafted to ready you for a thriving career in the dynamic realm of technology. Building a robust foundation in critical areas like programming, data structures, algorithms, and operating systems, you'll cultivate a deep grasp of computer science fundamentals. Furthermore, you'll have the exhilarating opportunity to specialize in areas like artificial intelligence, machine learning, or software engineering, aligning your studies with your specific interests. With a strong emphasis on hands-on learning, the curriculum integrates coding exercises, collaborative projects, and practical case studies, enabling you to apply your knowledge to real-world scenarios. Course offerings encompass Programming, Data Structures, Artificial Intelligence, Web Application Development, Machine Learning, Human-Computer Interaction, Cloud Computing Security, and more. Guided by our accomplished faculty, a team of experts and seasoned researchers, you'll embark on a transformative educational journey, poised to excel in the tech industry and contribute to future breakthroughs in the realm of computer science.

1.1 Name of the Programme:

B.Sc. Computer Science

1.2 Code of the Programme

All Computer Science courses are designated “COM''. Faculty courses are designated “COS '' while General studies courses are designated "GST" and "ENT". Courses from the Faculty of Science are designated MTH and PHY. Other

Faculty courses designation are Cybersecurity, “CYS”; Data Sciences, “DTS ; Information and Communication Technology, “ICT”; Information Systems, “INS''.

1.3 Description of the Programme and Duration

The B.Sc. Computer Science program consists of two semesters of formal University Studies per academic session. In the 200 and 300 levels, the traditional 12-week Students Industrial Work Experience Scheme (SIWES) during long vacations is now spread across these levels, ensuring students have a maximum of 24 weeks for industrial attachment, which runs

concurrently with their studies. After the attachment, students are required to write, present, and defend a report on their industry experience.

In the 400 Level, each student undertakes a year-long project in a field of their choice, in addition to the usual prescribed courses. A report on this project is also to be presented and defended.

The B.Sc. The Computer Science program is designed to be completed in four sessions (eight semesters) for students admitted at 100 level and three years (six semesters) for those admitted at 200 level. It's important for students to aim to graduate within the prescribed time frame. However, in cases where students cannot graduate within the regular number of sessions, those admitted at 100 level have a maximum of six years (12 semesters) to complete their degree, while those admitted at 200 level have a maximum of five years (10 semesters).

1.4 Semester Duration

A semester is divided into 8 weeks of classes, one week for mid semester break, one week for out of class experience and project based learning, two weeks of revision and two weeks for final examinations. Students who chose the part time mode will require a minimum of eight sessions to complete the BSc programme in Computer Science.

2.0 Programme Philosophy, Vision and Mission

2.1 Philosophy

The program's philosophy aims to equip learners with the skills to critically analyze and acquire specialized knowledge in comprehending the intricacies of unimpeded social and structural transformations. It also focuses on how these variations are reflected in diverse localized responses to national and regional development strategies. The primary mission of the program is to graduate individuals who possess essential skills, capabilities, and pertinent knowledge, obtained through adaptable and easily accessible learning methods. These empowered graduates are well-prepared to make substantial contributions to technological innovation and research, while effectively addressing real-world challenges in the ever-evolving domain of computer science.

2.2 Vision

Our aspiration is to be acknowledged as a globally renowned department and institute, delivering exceptional undergraduate and postgraduate programs in Computer Science. Our vision is to offer highly accessible, top-tier education, enabling students to emerge as industry leaders and champions of innovation.

2.3 Mission

We are committed to providing practical, cost-efficient, and adaptable learning experiences that enhance the lifelong educational quality in Computer Science. Our dedication extends to aligning with the National Policy on Education and the principles of the West Midlands Open University to ensure that our graduates are well-equipped with cutting-edge skills and knowledge to thrive in the digital era.

3.0 Aim and Objectives

3.1 Aim

The Computer Science program strives to offer students a thorough grasp of the fundamental principles and ideas in the field of computer science. It aims to cultivate a profound understanding of technology and its practical applications, equipping students to tackle the continuously emerging challenges within the domain of computer science.

3.2 Objectives:

Upon program completion, students should be able to:

i. Analyze and resolve contemporary computer science challenges, proposing innovative, practical solutions for real-world problems.

ii. Demonstrate proficiency in using essential skills and expertise to identify and address various technical issues within the computer science domain.

iii. Apply appropriate analytical frameworks to dissect complex technological scenarios, make informed decisions, and contribute to field advancements.

iv. Explore multidisciplinary perspectives in computer science, enabling exploration of specialized areas and the development of expertise in specific domains.

v. Assess global technological trends and emerging issues for diverse careers in the technology industry, private sectors, public institutions, and research organizations, while also contributing to the global digital landscape's advancement.

3.3 General Learning Outcomes

Upon successful completion of the B.Sc. Computer Science program, students will develop the following competencies:

1. Proficiency in the fundamental principles of basic science and computer science.
2. An understanding of entrepreneurship, the importance of innovation, and the innovation process, coupled with a dedication to continuous learning.
3. A comprehensive mastery of technical expertise within the computer science domain.
4. The ability to analyze problems, capture requirements, define issues, and execute integrated software development for real-world problem-solving.
5. The capability to continuously enhance their knowledge, skills, and expertise in computer science throughout their professional journey.
6. Effective communication skills for collaboration with computer scientists, software engineers, professionals from diverse fields, managers, and the broader community.
7. The skill to initiate and lead significant computer science projects, adeptly identifying issues, devising strategies, and finding solutions.
8. Proficiency in working independently, as part of multidisciplinary and multicultural teams, and as a leader or manager, with the capacity to support and inspire team members.
9. Awareness of the societal, cultural, global, and business implications of the computer science profession, with an emphasis on sustainability and adaptability principles.
10. A strong understanding of and commitment to professional and ethical responsibilities.

3.4 Unique Features of the Programme

The program's distinctive attributes include:

1. A deliberate focus on comprehensive coverage and cultivating proficiency in the utilization of open source software.

2. An additional hands-on practical element integrated into several courses to encourage active student involvement in the learning process, fostering enhanced learning outcomes and the development of soft skills.
3. A strong emphasis on formal methods and comprehensive coverage of computing concepts and principles related to algorithms.

3.5 Employability Skills

In Nigeria, much like in numerous other countries, there exists a wealth of opportunities for individuals with computing expertise. Nonetheless, due to the fierce competition in the job market, possessing a solid Computer Science degree, while important, might not be adequate for securing employment. Employers are increasingly seeking candidates who can demonstrate a range of employability skills, including effective communication, teamwork, organizational and management capabilities, critical thinking, leadership, technological proficiency, and self-management. The courses within this program have been customized to foster and enhance the acquisition of these skills among program graduates.

Among the 21st Century skills emphasized in this program are creativity, information literacy, media literacy, adaptability, interpersonal skills, problem-solving, collaboration, global awareness, innovation, and critical thinking.

4.0 Programme Requirements

4.1 Admission requirements

- For entry at 100 level, the candidate is expected to have Five Ordinary Level (O/L) credit passes at not more than two sittings, including English Language, Mathematics, Physics, and two other science-related subjects.
- For entry into 200 level, the candidate is expected to have a minimum of any of the following
    1. A-level Credit in English Language, Mathematics, Physics, Chemistry, Biology or Agricultural Sciences
    2. Upper Credit at Ordinary National Diploma OND from a recognised institution in Computer Engineering, Computer Science, Electrical Electronics Engineering, or Electrical Engineering

- For entry into 300 level, the candidate is expected to have a minimum of any of the following;
    1. A minimum of lower credit at the Higher National Diploma HND from a recognised institution in Computer Engineering, Computer Science, Electrical Electronics Engineering, or Electrical Engineering.

4.2 Graduation requirements

To be eligible for the award of the Bachelor degree in Computer Science, a student must have:

1. passed all the core courses, university and faculty/school required courses and electives;
2. accumulated a minimum of 120 course units for students admitted in 100 level and 90 course units for students admitted to 200 level; and
3. attain a minimum CGPA of 1.00.

To graduate, a student must be found worthy in character throughout the period of his/her studentship and must accumulate the total units prescribed for the programme from Core, Faculty and General Studies courses as well as SIWES, Seminar and Final Year Project.

5.0 Programme Structure and Degree Rules

To satisfy the University Regulation for the award of B.Sc. Computer Science students must have a minimum of 121 credit units. The courses are to be selected from both the compulsory and elective courses. A student must register for at least 15 credit units and a maximum of 24 credit units per semester. The maximum credit unit may be waived in exceptional circumstances on the merits of each case by the Head of the Department on behalf of the Senate to reflect the ODL model of the University.

Compulsory Courses C : These courses are essential for successful completion of the programme and are factored into the final grade regardless of the number of attempts allowed by the programme.

Elective Courses E : Students have the freedom to select these courses based on their interests and guidance from their course advisor. These additional courses complement the degree

requirements, and passing them is recommended as they contribute to the final grade calculation.

6.0 Deferment

In order to request a deferral for either a semester or an entire session, students are required to complete and submit a formal application to the Vice-Chancellor. This application should follow a process involving review and approval by the Head of Department and the Dean of Faculty, with the final decision resting with the Senate. To ensure timely consideration and approval, it is crucial to submit the application well in advance.

Grounds for requesting deferment include:

(i) Issues related to admission
(ii) Health-related concerns
(iii) Emotional stress
(iv) Other exceptional circumstances

7.0 Examination Guidelines

Following the conclusion of each semester, examinations are typically administered, which may encompass written tests, oral assessments, practical evaluations, CBT proctoring, project submissions, or a combination of these, as sanctioned by the Senate. The examination outcomes generally encompass the assessment of Continuous Assessment (C.A.) from coursework..

7.1 Eligibility to write End of Semester Examination

In order to qualify for examinations, it is compulsory to have a minimum online participation/completion rate of 75% in all classes, tutorials, laboratories, and other pertinent activities.

7.2 Examination Conduct

1. Examinations are supervised at designated West Midlands Open University CBT centers. Students are required to be present at the examination venue a minimum of 30 minutes before the scheduled exam time. Late entry is permitted up to 30 minutes after the exam has commenced, but no additional time will be granted. During the first hour and the final 15 minutes of the examination, students are not allowed to leave the venue.

2. If a student needs to leave the examination room, re-entry is allowed only if they have been continuously observed by an Invigilator/Assistant Invigilator.

3. For each examination, students must carry and display their ID card and Examination Card on their desks, signing the provided Attendance List with their name and matriculation number.

4. The examination room strictly prohibits the presence of books, printed materials, written documents, or unauthorized items, except as allowed by the exam paper regulations. Students are not permitted to offer or receive assistance from other students or use unauthorized devices during the examination.

5. If a student is suspected of violating these rules, cheating, or engaging in disruptive behavior, the Department should promptly report the incident to the Faculty Examination Officer and the Dean. The Dean will initiate an investigation and report to the Board of Examiners. The student involved will be allowed to continue the examination unless their actions cause further disturbance. The Board of Examiners may subsequently recommend to the Faculty Board and Senate whether the student's exam should be accepted and any further actions to be taken.

6. Students are instructed to clearly write their examination number at the top of the cover of each answer booklet or a separate sheet of paper if required. The use of scrap paper is not allowed; all rough work should be completed in the answer booklet, which should be submitted to the invigilator. No printed question papers or any other provided materials should be taken from the examination room or defaced.

7. At the conclusion of the designated examination time, students must cease writing upon the invigilator's instruction and allow for the collection of their answer scripts.

7.3 Discipline

The examination regulation outlined above is binding on all students, and any violation of these rules will result in serious consequences, as specified below:

1. Expulsion from the University: The following offences will lead to expulsion:
    a. Impersonation during examinations, which includes exchanging examination numbers, name/answer sheets, or intentionally using someone else's examination number.
    b. Exchanging relevant materials in the examination hall, such as question papers containing relevant jotting and materials.
    c. Exchanging answer scripts.
    d. Introducing unauthorised materials into the examination hall.

2. Rustication for one academic year: The following offenses will result in rustication for one academic session:
    a. Non-submission or incomplete submission of answer scripts.
    b. Collaboration or copying from other students.
3. Written Warning: The following offences will warrant a written warning:
    a. Speaking or engaging in conversation during the examination.
    b. Writing on question papers.

These punishments are in place to ensure the integrity of the examination process and to discourage any form of misconduct or cheating. Students are expected to adhere to these rules and regulations strictly to maintain academic honesty and uphold the West Midlands Open University's standards.

8.0 Grading System

Continuous assessment comprising tests, assignments, and other suitable methods contributes 40% to the overall evaluation during the semester. The examination conducted at the end of the semester holds a weightage of 60%. The final grade for each course is determined based on a total of 100% marks, combining both continuous assessment and end-of-semester examination results. The score from each course is assigned appropriate letter grade as follows:

(i) Credit Units	(ii) Percentile Scores	(iii) Letter Grades	(iv) Grade Points (GPA)	(v) Grade Point Average (GPA)	(vi) Cumulative Grade Point Average (CGPA)	(vii) Class of Degree
Vary according to contact hours assigned to each course per week per semester and according to workload carried by	70 - 100	A	5	Derived by multiplying (i) and (iv) and dividing by Total Credit Units	4.50 – 5.00	First Class
	60 - 69	B	4		3.50 4.49	2nd Class Upper
	50 - 59	C	3		2.40 – 3.49	2nd Class Lower
	45 - 49	D	2		1.50 2.39	Third Class

each student	40 - 44	E	1		1.00 1.49	Pass Degree
	0 – 39	F	0		-	-

8.1 Academic Standing Categories: Clear, Warning, Probation, and Withdrawal

The academic standing of students is determined by their Cumulative Grade Point Average CGPA , with the minimum acceptable CGPA set at 1.00.

1. Clear Academic Standing: To be in Clear Academic Standing, a student must maintain a CGPA of not less than 1.00.
2. Warning: A warning is issued to a student whose CGPA falls below the minimum tolerable level for the first time. This warning is typically communicated through verbal advice by the Level Coordinator, ensuring the student understands the implications of falling below the minimum CGPA in the subsequent semester examinations.
3. Academic Probation: Academic Probation is assigned to a student who fails to maintain a minimum CGPA of 1.00 by the end of the session. The probationary status can be reversed if the student achieves a CGPA of at least 1.00 in any subsequent semester after the first year. The responsibility for reversing the probationary status lies with the student. The University will provide a written preliminary notice of poor academic standing to the student.
4. Withdrawal for Academic Failure: If a student fails to maintain a CGPA of 1.00 for two 2 consecutive Academic Sessions at the end of any session, they will be required to withdraw from the academic program due to academic failure.

9.0 Departmental Issue Resolution Process

The procedure for handling student-related matters includes the following stages:

1. In the initial step, students are advised to either report via email or hold a discussion regarding their concerns with their Course Level Coordinator or Academic Student Adviser.

2. If the issue surpasses the purview of the Coordinator or Student Adviser, it will be elevated to the Examination Officer in the case of academic concerns, or to the Head of Department.

3. In cases where a resolution cannot be reached through the preceding steps, the matter will be formally brought to the attention of the Dean of the Faculty for additional review and resolution.

10.0 Outline of Course Structure

100 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1.	MAT 101	Elementary Mathematics I - Algebra and Trigonometry	2	Core	30	0
2.	PHY 101	General Physics I – Mechanics	2	Core	30	
3.	PHY 103	General Practical Physics I - Mechanics	3	Core		
4.	COM 101	Introduction to Computers	2	Core		
5.	GST 101	Use of English and Communication Skills I	2	Core		
6.	GST 109	Use of Library and ICT skills	2	Core		
7	BUA 101	Introduction to Business I	2	Core		
8	BUA 107	Logic and Critical Thinking	2	Core		
		Sub-Total	16			

Note: Two (2) units Elective(s) required TOTAL **17**

100 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH

1	PHY 102	General Physics II – Electricity & Magnetism	2	Core		
2	PHY104	General Practical Physics II - Electricity & Magnetism	1	Core		
3	MAT 102	Elementary Mathematics II – Calculus	2	Core		
4	MAT 104	Introduction to Statistics	3	Core		
5	COM 142	Problem Solving	3	Core		
6	GST 102	Nigerian People and Culture	2	Core		
7	COM 102	Information Technology System Hardware and Software	2	Core		
8	BUA 122	Introduction to Entrepreneurial Skills	2	Core		

Note: Two (2) units Elective(s) required TOTAL **17**

200 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	COM 201	Discrete Structures	2	Core		
2	COM 203	Digital Logic Design	2	Core		
3	MAT 201	Mathematical Methods I	2	Core		
4	COM 205	Computer Programming I	3	Core		

5	GST 201	Philosophy, Logic and Human Existence	2	Core		
6	ENT 211	Entrepreneurship and Innovation	2	core		
7	INS 207	Introduction to Information Systems	2	Elective		
8	DTS 201	Introduction to Data Science	2	Elective		
9	SEN 201	Introduction to Software Engineering	2	core		

200 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Staus	LH	PH
1	COM 208	Computer Programming II	3	core		
2	MAT 202	Differential Equations	2	Core		
3	COM 204	Computer Organization & Architecture	2	Core		
4	SIW 200	SIWES I	3	Core		
5	CYS 212	Systems Analysis and Design	3	Elective		
6	INS 202	Human Computer Interaction	3	Elective		
7	INS 242	Principles of Information Systems	3	Elective		

Note: Four (4) units Elective(s) required TOTAL **16**

300 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	COM 307	Principles of Database Systems		Core		
2	COM 301	Data & Computer Communications	3	Core		
3	COM 305	Principles of Operating Systems	3	Core		
4	CYS 301	Cryptography	3	Elective		
5	**INS 321**	Database Security and Auditing	2	Elective		
6	INS 387	Information Systems Innovation and New Technologies	3	Elective		
7	**COM 321**	Internet of Things	2	Elective		

Note: Two (2) units Elective(s) required TOTAL **16**

300 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	COM 302	Data Structures & Algorithms	3	core		
2	COM 312	Artificial Intelligence	2	core		
3	SIW 300	SIWES II	3	core		
4	GST 312	Peace and Conflict Resolution	2	core		

5	ENT 312	Venture Creation	2	core		
6	COM 322	Computer Science Innovation and New Technologies	2	core		
7	BUA 312	E-Commerce	2	Elective		
8	INS 316	Principles of information security	3	Elective		

400 Level 1st Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	TRP 401	Technical Report Writing	3	core		
2	PRO 401	Project Management	2	core		
3	SDP 411	Design Project	3	core		
4	INS 471	Advanced Databases	2	Elective		
5	COM 411	Distributed and Cloud Computing	3	Elective		
6	INS 421	Information Technology for Development	3	Elective		

7	INS 423	Information Technology and Business Analytics	3	Elective		
8	INS 425	Database Administration	3	Elective		
9	COM 423	Mobile Application Development	3	Elective		
10	COM 421	Computer Graphics and Visualization	3	Elective		
11	DTS 423	Machine Learning with Deep Learning	3	Elective		

400 Level 2nd Semester

S/N	Course Code	Course Title	Credit Unit	Status	LH	PH
1	SDP 412	Design Project	3	Core		
2	COM 402	Design & Analysis of Algorithms	2	Core		
3	COM 404	Software Engineering Professional Ethics	2	Core		
4	CYS 412	Deep and Dark Web Security	2	Elective		
5	INS 412	Ethics, Quality and Sustainability in Technological Environments	2	Elective		
6	COM 412	Data Mining	3	Elective		

7	INS 422	Database Analysis and Design	3	Elective		
8	INS 424	Information Resource Management	3	Elective		
9	INS 426	Mobile Application Development	3	Elective		
10	COM 422	Blockchain Technologies	3	Elective		
11	COM 424	Web Application Development	3	Elective		
12	DTS 424	Statistical Computing with SAS and R	3	Elective		

A MINIMUM OF 31 CREDIT UNITS

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Core courses (Departmental) : 31 units

Core courses (General Studies) : 0 units

Electives : 0 units

Level Total : 31 units

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11.0 Summary of Distribution of Course Credit at all Levels

Level	**GST and Other General Courses**	**Subject /Specialization Area**		**Total**
		Compulsory	Elective	
100	4	26	4	**34**
200	4	24	4	**32**
300	4	27	4	**35**
400	0	31	0	**31**

Total	**12**	**108**	**12**	**132**

12.0 Curriculum/Syllabus of all Courses in the Programme

100 Level Courses

Course code	**MAT 101**
Course title	**Elementary Mathematics I - Algebra and Trigonometry**
Weight	2 Credit Units; LH 30
Learning Outcomes	At the end of the course, students should be able to: 1. Understand the basic definition of Set, Subset, Union, Intersection, Complements and use of Venn diagrams; 2. Solve quadratic equations; 3. Solve trigonometric functions; 4. Understand the various types of numbers; 5. Solve some problems using Binomial theorem; Apply mathematical concepts and skills to solve real-world problems; 6. Communicate mathematical ideas clearly and concisely, both verbally and in writing; 7. Use technology effectively to solve mathematical problems and create mathematical representations; 8. Work collaboratively to solve mathematical problems and learn from each other
Course content	Introduction to Elementary Mathematics. Real Numbers. Real Sequences and Series. Quadratic Equations. Binomial Theorems Complex Numbers. De-Moivre's Theorem. Circular Measure. Trigonometry Identities. Application of Trigonometry.

Course code	**PHY 101**
Course title	**General Physics I – Mechanics**
Weight	2 Credit Units; LH 30

Learning Outcomes	At the end of the course, students should be able to: 1. describe the electric field and potential, and related concepts, for stationary charges; 2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential; 3. describe and determine the magnetic field for steady and moving charges; 4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law; 5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws; 6. explain the basic physical of Maxwell's equations in integral form; 7. evaluate DC circuits to determine the electrical parameters;
Course content	Introduction to Space and Time. Units and Dimensions. Vectors and Scalars. Differentiation of Vectors. Displacement, Velocity, and Acceleration. Kinematics. Newton's Laws of Motion. Application of Newtonian Mechanics. Conservation Principles in Physics. Electrostatics.
Course code	**PHY103**
Course title	**General Practical Physics I - Mechanics**
Weight	(1 Units C: LH 15 PH 45)
Learning Outcomes	By the end of this course, students should be able to: 1. Conduct measurements of some physical quantities; 2. Make observations of events, collect and tabulate data; 3. Identify and evaluate some common experimental errors; 4. Plot and analyse graphs; and 5. Conclude numerical and graphical analysis of data. 6. Apply the principles of mechanics to solve practical problems; 7. Use various tools and equipment to safely and accurately conduct experiments; 8. Design and carry out experiments to test hypotheses; 9. Communicate scientific findings effectively, both verbally and in writing; and

	10. Draw conclusions from numerical and graphical analysis of data. 11. Work collaboratively to solve problems and achieve common goals
Course content	Introduction to General Practical Mechanics. Measurements and Error Analysis. Mechanical Systems. Electrical and Mechanical Resonant Systems. Light and Heat. Viscosity and Fluids. Designing and Building Simple Mechanical Systems. Friction and Wear. Lubrication and Bearings. Applying Mechanics to Solve Practical Problems.
Course code	**COM 101**
Course title	**Introduction to Computers**
Weight	(3 Units C: LH 30)
Learning Outcomes	On successful completion of this module, students will be able to: 1. Explain the basic components of computers and other computing devices; 2. Describe the various applications of computers; 3. Explain information processing and its roles in the society; 4. Describe the Internet, its various applications and its impact; 5. Explain the different areas of the computing discipline and its specialisations and 6. Demonstrate practical skills in using computers and the Internet. Understand the principles of problem-solving and algorithm design 7. Understand the basics of programming languages. 8. Understand data structures and algorithms 9. Understand the different operating systems 10. Understand computer networks 11. Understand the ethical and social implications of computing
Course content	Understanding the Computer. Computer Hardware. Computer Software and Humanware. Programming The Computer. Information Processing. Information processing and its roles in society. The

	Internet, its applications and its impact on the world today. Cloud computing. Big data. The future of computing.
Course code	**GST 101**
Course title	**Use of English and Communication Skills I**
Weight	(2 Units C: LH 30)
Learning Outcomes	On successful completion of this course, students will be able to: 1. Understand the importance of English and communication skills in various personal and professional contexts. 2. Demonstrate a solid foundation in English grammar, vocabulary, and sentence structure. 3. Employ effective reading strategies to comprehend and analyse different types of texts. 4. Enhance their listening skills and effectively interpret spoken English. 5. Develop clear and coherent writing skills for different purposes and audiences. 6. Utilise idiomatic expressions and expand their vocabulary to enhance communication. 7. Apply active listening and non-verbal communication skills in interpersonal interactions. 8. Engage in effective oral communication, including presentations, group discussions, and debates. 9. Apply business communication skills, such as writing professional emails and conducting meetings. 10. Demonstrate practical interpersonal skills, including empathy, conflict resolution, and cultural sensitivity. 11. Employ digital communication skills and media literacy to navigate online platforms and evaluate information. 12. Prepare for job interviews and effectively communicate their qualifications and experiences. 13. Demonstrate an understanding of netiquette, ethical communication, and responsible use of technology. 14. Develop critical thinking skills to analyse and evaluate written and spoken content.

	15. Engage in self-reflection and continuous improvement of their English and communication skills. 16. Identify possible sound patterns in the English language to enhance pronunciation and communication. 17. List notable language skills, including listening, speaking, reading, and writing, and demonstrate proficiency in each area. 18. Classify word formation processes, such as affixation, compounding, conversion, and blending, to expand vocabulary and understand word relationships
Course content	Introduction to English and Communication Skills. Building Strong Foundations in English. Enhancing Vocabulary and Idiomatic Expressions. Developing Effective Writing Skills. Mastering Oral Communication. Listening and Comprehension Skills. Effective Business Communication. Interpersonal Skills and Building Relationships. Effective Interviewing Skills. Digital Communication and Media Literacy.
Course code	GST 109
Course title	**Use of Library and ICT skills**
Weight	2 Units C LH 30
Learning Outcomes	On successful completion of this module, students will be able to: 1. Demonstrate a comprehensive understanding of information literacy and its importance. 2. Effectively search, retrieve, and evaluate information from various sources. 3. Understand the different types of library resources and their utilisation. 4. Use their digital literacy and ICT skills for academic and professional applications. 5. Develop critical thinking and problem-solving abilities through research and information analysis. 6. Foster ethical and responsible use of information and technology.

Course content	Overview of library; Types of library; Sources of Information Cataloging and Classification; Library rules and regulations Introduction to information and communication technology (ICT) Introduction to Computer; Internet ; Introduction to Network Computer Threats
Course code	**BUA 101**
Course title	**Introduction to Business I**
Weight	2 Units C LH 30
Learning Outcomes	On successful completion of this module, students will be able to: 1. Demonstrate a comprehensive understanding of various forms of business ownership, ethical considerations, and the role of social responsibility in business decision-making. 2. Apply effecti ve communication strategies in a business context, including written, verbal, and non-verbal communication, while identifying and overcoming barriers to communication. 3. Analyse and evaluate key management and leadership principles, including the functions of management and different leadership styles, to effectively contribute to organisational success. 4. Evaluate economic theories and their implications for business operations, demonstrating an understanding of macroeconomic and microeconomic concepts and their relevance in decision-making. 5. Interpret financial statements, utilise cost accounting techniques, and analyse marketing strategies to make informed business decisions and contribute to organisational growth.
Course content	Overview of Business. Types of Business Operations. Business Ethics and Social Responsibility. Business Planning and Strategy. Management and Leadership. Economics for Businesses. Accounting and Financial Statements. Marketing. Business Communication. Legal and Regulatory Environment

Course code	BUA 107
Course title	**Logic and Critical Thinking**
Weight	2 Units C LH 30
Learning Outcomes	On successful completion of this module students will be able to: 1. Understand the basic concepts of logic and its importance in critical thinking and reasoning. 2. Apply logical principles to evaluate the strength and validity of arguments. 3. Break down arguments into their components (premises, conclusion) and identify the underlying assumptions. 4. Evaluate the strength of evidence and the relevance of premises to the conclusion. 5. Construct counterarguments and identify weaknesses or flaws in an argument. 6. Understand the concept of conditional statements and their components (antecedent, consequent). 7. Identify and avoid common conditional fallacies, such as affirming the consequent and denying the antecedent. 8. Understand the symbols and syntax of propositional logic, including logical operators (and, or, not), propositional variables, and truth tables. 9. Identify and analyse different types of fallacies, including ad hominem, slippery slope, hasty generalisation, equivocation, and straw man fallacy. 10. Identify and evaluate analogies effectively. 11. Define inductive reasoning and its distinction from deductive reasoning. 12. Define problem-solving and critical thinking and their relationship to each other. 13. Identify the key steps in the problem-solving process, including problem identification, analysis, solution generation, evaluation, and implementation. 14. Recognize the different types of information sources, including primary, secondary, and tertiary sources.

	15. Verify information using fact-checking websites and tools, and seek corroborating evidence from multiple sources. 16. Cite and reference sources accurately and appropriately using different citation styles, such as APA or MLA. 17. Define categorical propositions and their components, including quantifiers (all, some, none), subjects, and predicates. 18. Identify the four types of categorical propositions (A, E, I, and O) and their symbolic representations. 19. Understand the concept of conversion, contraposition, and obversion of categorical propositions.
Course content	Introduction to Logic. Argument Analysis. Conditional Reasoning. Propositional Logic. Fallacies. Reasoning with Analogy. Inductive Reasoning. Problem-Solving and Critical Thinking. Evaluating Sources and Information. Categorical Propositions.
Course code	**PHY 102**
Course title	**Electricity & Magnetism**
Weight	2 Units C LH 30
Learning Outcomes	At the end of the course, students should be able to: 1. describe the electric field and potential, and related concepts, for stationary charges; 2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential; 3. describe and determine the magnetic field for steady and moving charges; 4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law; 5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws; 6. explain the basic physical of Maxwell's equations in integral form; 7. evaluate DC circuits to determine the electrical parameters; 8. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

Course content	Introduction to Forces in Nature. Electric Charge and Its Properties. Coulomb's Law and Superposition. Electric Field and Potential. Gauss's Law and Capacitance. Electric Dipoles and Energy in Electric Fields. Magnetic Fields and Lorentz Force. Electromagnetic Induction and Faraday's Law. Maxwell's Equations and Electromagnetic Waves. AC Voltages and Currents in Circuits.
Course code	**PHY 104**
Course title	**General Practical Electricity & Magnetism**
Weight	1 Unit; PH 45
Learning Outcomes	At the end of the course, students should be able to: 1. conduct measurements of some physical quantities; 2. make observations of events, collect and tabulate data; 3. identify and evaluate some common experimental errors; 4. plot and analyse graphs; and 5. draw conclusions from numerical and graphical analysis of data.
Course content	This introductory course emphasises quantitative measurements, the treatment of measurement errors, and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of metres, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc., covered in PHY 101 and PHY 102. However, emphasis should
Course code	**MAT 102**
Course title	**Elementary Mathematics II – Calculus**
Weight	2 Units C LH 30
Learning Outcomes	By the end of the course, students will be able 1. to differentiate and explain rules in calculus, 2. analyse real-variable functions and graphs,

	3. grasp limits and continuity, 4. understand derivatives as the rate of change limits, and gain proficiency in integration techniques and definite integrals for solving area and volume problems.
Course content	Function of a real variable, graphs, limits and idea of continuity. The derivative is the limit of the rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of differentiation. Methods of integration, Definite integrals. Application to areas, volumes.
Course code	**MAT 104**
Course title	**Introduction to Statistics**
Weight	3
Learning Outcomes	Upon completion of this course, students will be able to: 1. explain the differences between permutation and combination; 2. explain the concept of random variables and relate it to probability and distribution functions; 3. describe the basic distribution functions; 4. explain the concept of exploratory data analysis; 5. apply statistical methods to solve real-world problems; 6. interpret and communicate statistical results effectively; 7. use statistical software to analyse data; 8. understand the ethical implications of using statistics.
Course content	Introduction to Statistical Methods. Descriptive Statistics. Statistical Distributions. Sampling and Estimation. Permutation and Combination. Hypothesis Testing. Statistical Analysis. Probability. Use of Statistical Software to Analyse Data. Module Summary.
Course code	**COM 142**
Course title	**Problem Solving**

Weight	3
Learning Outcomes	At the end of this course, students should be able to: 1. explain problem-solving processes; 2. demonstrate problem-solving skills; 3. describe the concept of algorithm development and properties of algorithms; 4. discuss the solution techniques of solving problems; 5. solve computer problems using algorithms, flowcharts, pseudocode, etc.; and 6. solve problems using programming languages using C, PYTHON, etc.
Course content	Introduction to Computing and Problem Solving. Methods of Solving Computing Problems. Solution Techniques for Problem Solving. Additional Solution Techniques. Advanced Problem-Solving Techniques. Problem-Solving Strategies. Solution Formulation and Design. Programming Basics - Part 1. Programming Basics - Part 2. Application and Practice.
Course code	**GST 102**
Course title	**Nigerian People and Culture**
Weight	2 Units C LH30
Learning Outcomes	On successful completion of this module, students will be able to: 1. Analyse the historical foundation of the Nigerian culture and arts in pre-colonial time 2. List and identify the major linguistic groups in Nigeria 3. Analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development 4. Know How to become a citizen of Nigeria 5. Enumerate the challenges of the Nigerian State towards Nation building 6. Analyse the role of the Judiciary in upholding people's fundamental rights 7. Understand the role of Military in Nigerian Politics

	8. Identify acceptable norms and values of the major ethnic groups in Nigeria 9. List and suggest possible solutions to identifiable Nigerian environmental, moral and value problems
Course content	Introduction to Nigeria's People and Culture. Northern Zone. Central Zone. Western Zone. Eastern Zone. Cultural Areas of Nigeria. The Evolution of Nigeria. Military in Nigerian Politics. Nigeria and the Wider World. Environmental , Moral and Value Problems.
Course code	**COM 102**
Course title	**Information Technology System Hardware and Software**
Weight	2
Learning Outcomes	At the end of this course, students should be able to: 1. Demonstrate Proficiency in Hardware Components: 2. Understand Operating System Functionality: 3. Develop Programming Skills: 4. Explore Software Applications: 5. Comprehend Network Architectures: 6. Enhance Communication Skills: 7. Understand Cybersecurity Principles: 8. Problem-Solving and Troubleshooting Skills: 9. Stay Informed about Technological Advancements: 10. Apply Ethical Practices: 11. Prepare for Industry Certification (Optional):
Course content	Introduction to IT Systems and Hardware. Operating Systems Fundamentals. Programming Basics. Software Applications and Development. Networking Essentials. Cybersecurity Principles. Midterm Assessment. Advanced Networking Concepts. System Integration Project. Final Presentations and Review.
Course code	**BUA 122**
Course title	**Introduction to Entrepreneurial Skills**

Weight	
Learning Outcomes	On successful completion of this module, students will be able to: 1. Students will understand fundamental entrepreneurship concepts and recognise the economic significance of entrepreneurship. 2. Identify the major classical, neoclassical, Austrian, and Schumpeterian entrepreneurial theories. 3. Develop effective business communication skills, both written and verbal, and enhance problem-solving and decision-making abilities crucial for entrepreneurial success. 4. Utilise negotiation skills to secure favourable outcomes in business deals, contracts, and partnerships. 5. Apply networking and leadership skills to expand one's professional network, foster collaboration, and achieve organisational success. 6. Understand the challenges and risks of entrepreneurship, including the risk of failure, the long hours and hard work, and the uncertainty of the business world. 7. Analyse the role of government policies, cultural factors, social networks and relationships, and access to technology in shaping the Nigerian entrepreneurial environment
Course content	Introduction to Entrepreneurship and Entrepreneurs. Entrepreneurial Theories. Types of Entrepreneurs. The Entrepreneurial Process. Entrepreneurial Skills: Negotiation. Entrepreneurial Skills: Networking, Leadership and Management Skills. Entrepreneurial Skills: Creative Thinking, Innovation Skills and Protection of Intellectual Property. Entrepreneurial Skills: Business Communication Skills, Problem-Solving and Decision-Making Skills. Entrepreneurial Skills: Identifying Entrepreneurial Opportunities and Finance Management. The Nigerian Entrepreneurial Environment.

200 Level Courses

Course code	COM 201
Course title	Discrete Structures
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of this course, the students will be able to: 1. convert logical statements from informal language to propositional and predicate logic expressions; 2. describe the strengths and limitations of propositional and predicate logic; 3. outline the basic structure of each proof technique (direct proof, proof by contradiction, and induction) described in this unit; 4. apply each of the proof techniques (direct proof, proof by contradiction, and induction) correctly in the construction of a sound argument; 5. apply the pigeonhole principle in the context of a formal proof; 6. compute permutations and combinations of a set, and interpret the meaning in the context of the particular application; 7. map real-world applications to appropriate counting formalisms, such as determining the number of ways to arrange people around a table, subject to constraints on the seating arrangement, or the number of ways to determine certain hands in cards (e.g., a full house); and 8. solve a variety of basic recurrence relations.
Course content	Propositional Logic. Predicate Logic. Sets. Functions. Sequences and Summation. Proof Techniques. Mathematical induction. Inclusion-exclusion and Pigeonhole principles. Permutations and Combinations (with and without repetitions). The Binomial Theorem. Discrete Probability. Recurrence Relations.

Course code	**COM 203**
Course title	**Digital Logic Design**
Weight	
Learning Outcomes	Upon successful completion of this course, students will be able to: ● Analyse and explain the role of Boolean algebra in computer logic design, including its applications in simplifying logical expressions and optimising digital circuits. ● Explain why everything is data, including instructions, in computers ● Identify and evaluate the ethical and social implications of using logic in computer science, considering issues such as privacy, security, and algorithmic bias. ● Demonstrate the ability to apply formal methods to software verification, including the use of formal specifications and model checking to ensure software correctness. ● Explain the principles of fault tolerance and error detection/correction mechanisms in computer systems and their significance in ensuring reliability. ● Describe how negative integers, fixed-length numbers, and non-numeric data are represented. ● Understand the concept of computational complexity and its relevance in analysing algorithm efficiency, including the ability to classify problems as P, NP, or NP-complete.

	● Apply the principles of automata theory to understand the concept of regular languages, finite automata, and regular expressions and how they relate to pattern matching and lexical analysis in computer science. ● Describe the fundamentals of formal languages and grammar and their role in programming language design, parsing, and compiler construction. ● Discuss the importance of propositional and predicate logic in artificial intelligence, including knowledge representation, reasoning, and problem-solving. ● Convert numerical data from one format to another. ● Design the basic building blocks of a computer: arithmetic-logic unit (gate-level), registers (gate-level), central processing unit (register transfer-level), and memory (register transfer-level).
Course content	Introduction to Computer Logic. Number Representation in Computers. Logic Gates and Digital Circuits. Combinational and Sequential Logic. Computer Architecture Fundamentals. Machine Instructions and Operation. Digital Circuits and Logic Expressions. Computer Building Blocks: ALU, Registers, CPU. Boolean Algebra in Logic Design. Ethical and Social Implications of Logic
Course code	MAT 201
Course title	Mathematical Methods I
Weight	(2 Units C: LH 30)
Learning Outcomes	At the end of the course students should be able to: 1. describe Real-valued functions of a real variable;

	2. solve some problems using Mean value Theorem and Taylor Series expansion; and 3. evaluate Line Integral, Surface Integral and Volume Integrals.
Course content	Real-valued functions of a real variable. Review of differentiation and integration and their applications. Mean value theorem. Taylor series. Real-valued functions of two and three variables. Partial derivatives chain rule, extrema, Lagrangian multipliers. Increments, differentials and linear approximations. Evaluation of line, integrals. Multiple integrals.

Course code	COM 205
Course title	Principles of Programming I
Weight	(3 Units C1: LH 30; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. identify different programming paradigms and their approaches to programming; 2. write programmes using basic data types and strings; 3. design and implement programming problems using selection; 4. design and implement programming problems using loops; 5. use and implement classes as data abstractions in an object-oriented approach; 6. implement simple exception handling in programmes; 7. develop programmes with input/output from text files; and 8. design and implement programming problems involving arrays.
Course content	Introduction to computer programming. Functional programming; Declarative programming; Logic programming; Scripting languages. Introduction to object-orientation as a technique for modelling computation. Introduction of a typical object-oriented language, such as Java. Basic data types, variables, expressions, assignment statements and operators. Basic object-

	oriented concepts: abstraction; objects; classes; methods; parameter passing; encapsulation. Introduction to Strings and string processing; Simple I/O; control structures; Arrays; Simple recursive algorithms; inheritance; polymorphism.

Course code	GST 201
Course title	Philosophy, Logic and Human Existence
Weight	2
Learning Outcomes	At the end of this course, students should be able to: Analyze the concept of humanity, including its origin, philosophical underpinnings, and cosmic environment. 2. Develop and enhance logical and critical thinking skills for effective problem-solving and decision-making. 3. Identify and appreciate the fundamental roles of science and technology within human society and services. 4. Describe both renewable and non-renewable environmental resources available in Nigerian society. 5. Recognize and apply resource conservation tools and techniques to promote sustainable environmental practices. 6. Analyze the environmental impacts of plastics and other forms of waste, and propose mitigation strategies. 7. Suggest viable management techniques and solutions for identifiable environmental challenges faced in various areas of Nigerian society. 8. Identify and describe unethical behavior patterns that can hinder human societal growth and development.
Course content	Introduction to Humanity and Philosophy. Developing Logical and Critical Thinking Skills. Science and Technology in Human Society. Environmental Resources in Nigerian Society. Climate Change and Sustainable Development. Environmental Effects of Plastics and Waste. Elements of Environmental Studies. Environmental Challenges in Nigerian Society. National Development Plans for a

	Sustainable Environment. Global Action for Environmental Sustainability.

Course code	**ENT 211**
Course title	**Entrepreneurship and Innovation**
Weight	2Units C LH15 PH45
Learning Outcomes	Upon the completion of this course, students should be able to: 1. Explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk-taking; 2. State the characteristics of an entrepreneur; 3. Analyse the importance of micro and small businesses in wealth creation, employment, and financial independence; 4. Engage in entrepreneurial thinking; 5. Evaluate and apply funding strategies; 6. Identify key elements in innovation; 7. Design and execute innovative business models; 8. Describe stages in enterprise formation, partnership and networking, including business planning; 9. Describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; 10. Navigate legal and ethical challenges in entrepreneurship and 11. State the basic principles of e-commerce.
Course content	Introduction to Entrepreneurship. Rationale and Relevance of Entrepreneurship. Characteristics of Entrepreneurs. Entrepreneurial thinking. Innovation and its dimensions. Enterprise formation and ownership. Contemporary Entrepreneurship Issues. Entrepreneurship in Nigeria. Overcoming Environmental and Cultural Barriers to. Entrepreneurship. Principles of E-Commerce.

Course code	**INS 207**
Course title	**Introduction to Information Systems**
Weight	2 Units C: LH 30
Learning Outcomes	At the end of this course, students should be able to: 1. explain system concepts and organisational processes; 2. explain information systems principles and application in modern organisation; 3. describe information technology security and related ethical issues; and 4. explain database management and system development life cycle.
Course content	Roles and relevance of information systems in organisations to conduct business and solve problems. Information systems principles in modern organisations. Systems concepts; organisational processes; technological aspects of information systems. The internet. Information technology security. Ethical issues. Database management. Systems development life cycle.

Course code	DTS 201
Course title	Introduction to Data Science
Weight	(3 Units C: LH 30; PH 45)

Learning Outcomes	At the end of the course, the students should be able to: 1. demonstrate the principles of working with data across distributions, sizes and ranges; 2. explain from first principles the operations that power data-driven utilities that have transformed the modern computing industry; and 3. demonstrate foundational technological processes that enable various data functions.

Course content	Fundamentals of Data Science. Methodology of extracting knowledge from big datasets as well as various tools and platforms for Data Science. What is Data and why is it important? Basic classification of Data (Structured, semi-structured and unstructured data), Scope of Data Science, Steps of Data Science Process: Data collection, Pre-processing, training, and testing. Rudiments of data visualisations; Distributions, Probability, and Simulations; Predictions and Models. Use cases in various domains such Image, Natural Language, Audio and Video. Basic introduction to knowledge extraction: Data mining, Business Intelligence & Knowledge management, Introduction to Big Data integration and intelligence, Introduction to Data Analytics, Introduction to programming. Lab work: Practical experiments on data science process steps in simulated models. Practical application of the methods and tools used in data science for prediction models with some simulated exerises. Practical experiments on how to extract knowledge; how to mine valuable data from large set of data sets using data mining process and methods. Learn how to integrate business intelligence in big data along with some data analytics pratical exercises. Simple exercises on R programming to enhance the coding knowledge acquired during theory class.

Course code	SEN 201
Course title	Introduction to Software Engineering
Weight	(2 Units C: LH 30)
Learning Outcomes	On successful completion of this module students will be able to: 1. Understand the fundamental concepts and principles of software engineering 2. describe the concept of the software life cycle; 3. explain the phases of requirements analysis, design, development, testing and maintenance in a typical software life cycle; 3. differentiate amongst the various software development models; 4. utilise UML for object-oriented analysis and design; 5. describe different design architectures; 6. explain the various tasks involved in software project management; 7. describe the basic legal issues related to Software Engineering. 8. Identify and apply the different roles and responsibilities of software engineers
Course content	Software Engineering Concepts and Principles. Software Lifecycle and Process assessment Models. Software verification and validation, Process Models Life Cycle of Software System. Software Requirements and Specifications. Introduction to Software Design. Software Architecture. Software Metrics. Software Quality and Testing. Software Evolution.
Course code	COM 208

Course title	Principles of Programming II
Weight	(3 Units C: LH 30; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. develop solutions for a range of problems using object-oriented programming; 2. use modules/packages/namespaces for programme organisation; 3. use API in writing applications; 4. apply divide and conquer strategy to searching and sorting problems using iterative and/or recursive solutions; 5. explain the concept of exceptions in programming and how to handle exceptions in programmes; 6. write simple multithreaded applications; and 7. design and implement simple GUI applications.
Course content	Review and coverage of advanced object-oriented programming - polymorphism, abstract classes and interfaces. Class hierarchies and programme organisation using packages/namespaces. Use of API – use of iterators/enumerators, List, Stack, Queue from API; Searching; sorting; Recursive algorithms; Event-driven programming: event-handling methods; event propagation; exception handling. Applications in Graphical User Interface (GUI) programming.

Course code	**MAT 202**
Course title	**Differential Equations**
Weight	(2 Units C: LH 30)

Learning Outcomes	At the end of the course, students should be able to: 1. define the following: order and degree of a differential equation; 2. describe some techniques for solving first and second-order linear and non-linear equations; and 3. solve some problems related to geometry and physics.

Course content	Derivation of differential equations from primitive, geometry, physics, etc. order and degree of a differential equation. Techniques for solving first and second-order linear and non-linear equations. Solutions of systems of first-order linear equations. Finite linear difference equations. Application to geometry and physics
Course code	**COM 204**
Course title	**Computer Organization & Architecture**
Weight	
Learning Outcomes	By the end of this course, students should be able to: ● Explain the organisation of the classical von Neumann machine and its major functional units; ● Construct simple assembly language program segments; ● Describe how fundamental high-level programming constructs are implemented at the machine-language level; ● Discuss the concept of control points and the generation of control signals using hardwired or microprogrammed implementations; ● Describe how the use of memory hierarchy (cache, virtual memory) is used to reduce the effective memory latency; and

	● Explain the concept of interrupts and describe how they are used to implement I/O control and data transfers.

Course content	Introduction to Computer Hardware and Instruction Set Architecture (ISA). CPU and Instruction Execution. Addressing Modes and Flow Control. Data Path and Control Unit Design. Assembly Language Programming. Memory Hierarchy and Cache Memory. Virtual Memory and I/O Organisations. Lab Work and Programming Assignments. Advanced Topics in Computer Architecture. Review and Application

Course code	**SIW 200**
Course title	**SIWES I**
Weight	(3 Units C: PH 135)
Learning Outcomes	At the end of the course, the students should be able to: 1. appreciate the realities of the computing industry beyond the walls of the University, through an attachment with an organisation in the computing industry; and 2. apply the skills and knowledge they acquired in class towards solving real problems in actual working environments.
Course content	Requires 3 months of Industrial Training after the completion of 300 Level. Students' experience will be documented and presented in a Seminar.

Course code	**CYS 212**

Course title	**Systems Analysis and Design**
Weight	
Learning Outcomes	At the end of this course, students should be able to: 1. describe system requirements gathering techniques; 2. explain data modelling technique (entity relationship modelling); 3. explain process modelling technique (data flow diagram); 4. describe system architectural design; 5. describe process and database design; and 6. explain user interface design.

Course content	Structured approach to analysis and design of information systems for businesses. Software development life cycle. Structured top-down and bottom-up design. Dataflow diagramming. Entity relationship modelling. Computer aided software engineering. Input and output, prototyping design and validation. File and database design. Design of user interfaces. Comparison of structured and object-oriented design.
Course code	**INS 202**
Course title	**Human Computer Interaction**
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. discuss the foundations and concept of human-computer interface; 2. explain the principles of human-computer interface; 3. explain the design and development of the human-computer interface; and

	4. explain the importance of user feedback.

Course content	Foundations of HCI. Concept underlying the design of HCI. Principles of GUI. GUI toolkits. System design methods. User conceptual models and interface metaphors. Human cognitive and physical ergonomics. Human-centred software evaluation and development. GUI design and programming.
Course code	**INS 242**
Course title	**Principles of Information Systems**
Weight	(3 Units E: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. explain system concepts and organisational processes; 2. explain information systems principles and application in modern organisation; 3. describe information technology security and related ethical issues; and 4. explain database management and system development life cycle.
Course content	Roles and relevance of information systems in organisations to conduct business and solve problems. Information systems principles in modern organisations. Systems concepts; organisational processes; technological aspects of information systems. The internet. Information technology security. Ethical issues. Database management. Systems development life cycle.

300 Level Courses

Course code	**COM 307**
Course title	**Principles of Database Systems**
Weight	
Learning Outcomes	At the end of the course, the students should be able to: ● Describe the components of a database system and give examples of their use. ● Describe the differences between relational and semi-structured data models. ● Explain and demonstrate the concepts of entity integrity constraint and referential integrity constraint. ● Apply queries, query optimisations and functional dependencies in relational databases. ● Describe properties of normal forms and explain the impact of normalisation on the efficiency of database operations. ● Describe database security and integrity issues and their importance in database design. ● Explain the concepts of concurrency control and recovery mechanisms in database ● Design a relational database schema for a given problem domain. ● Implement a relational database using a database management system (DBMS). ● Tune the performance of a relational database using query optimization techniques.

	● Identify and resolve database security and integrity vulnerabilities. ● Implement and test concurrency control and recovery mechanisms for a relational database.

Course content	Introduction to Database Systems. Conceptual Methods and Relational Data Models. Database Design. Database Security and Integrity. Introduction to query processing and optimization. Introduction to concurrency and recovery. Database Implementation. Database Query Language. Database performance tuning. Practical project/ Lab work

Course code	**COM 301**
Course title	**Data & Computer Communications**
Weight	
Learning Outcomes	At the end of this course, students should be able to: ● Define various terminologies relating to Data communication; ● Explain the Seven Layer ISO-OSI standard protocols and network architecture; ● Describe different error-detection methods; ● Describe Internet Technologies and Protocols, and ● List the features and benefits of a Network Operating System. ● Analyse Network Performance ● Design Network Topologies.

Course content	Types and Sources of Data. Simple Communications Network. Transmission Definitions. One-way Transmission. Half-duplex Transmission. Transmission Codes. Transmission Modes. Efficiency of Transmission. Protocols: Introduction. Seven Layer ISO-OSI Standard Protocols and Network Architecture
Course code	**COM 305**
Course title	**Principles of Operating Systems**
Weight	
Learning Outcomes	At the end of this course, students should be able to: 1. Recognise operating system types and structures; 2. Analyse System Performance; 3. Describe OS support for processes and threads; 4. Recognise CPU scheduling, synchronisation, and deadlock; 5. Resolve OS issues related to synchronisation and failure for distributed systems; 6. Explain OS support for virtual memory, disk scheduling, I/O, and file systems; 7. Identify security and protection issues in computer systems; 8. Evaluate the trade-offs between different file system designs and explain how they impact data storage and retrieval efficiency; 9. Demonstrate a deep understanding of virtualisation technology and its role in modern computing environments, and 10. Use C and Unix commands, examine the behaviour and performance of Linux, and develop various system programs under Linux to use OS concepts related to

	process synchronisation, shared memory, mailboxes, file systems, etc.

Course content	Introduction to Operating Systems. OS Structures. Process Management. Memory Management. File Systems. I/O Systems. Security and Protection. Distributed Systems. Case Studies. Review and Project Presentations

Course code	**CYS 301**
Course title	**Cryptography**
Weight	
Learning Outcomes	By the end of this course, students should be able to: 1. define cryptography as simple cryptosystems, symmetric and asymmetric cryptography, symmetric cryptosystems and asymmetric cryptosystems; 2. differentiate key management and encryption algorithms, types of cryptography and cryptographic techniques; 3. practice cryptanalysis of cypher and how to use protocols, hashing, digital signatures, and certificates; 4. examine the certificate authorities, policies, procedures, and methods for the proper use of cryptography in secure systems; 5. identify public-key cryptography and discrete algorithms, cryptography and its mathematical background, and understand hash functions, data integrity, authentication, algorithmic number theory, primality testing and true primality testing; and

	6. discuss factoring integers, RSA, security of RSA encryption, security of RSA key generation, and discrete logarithm cryptographic schemes. 7. Demonstrate the ability to implement various cryptographic algorithms, such as the Advanced Encryption Standard (AES) and the RSA algorithm, to encrypt and decrypt data securely. 8. Analyse real-world security scenarios and assess how cryptography can be applied to mitigate threats and vulnerabilities in network and information systems. 9. Evaluate the strengths and weaknesses of cryptographic protocols like SSL/TLS, IPsec, and SSH in securing network communication.

Course content	Introduction to Cryptography. Symmetric and Asymmetric Cryptography. Key Management and Encryption Algorithms. Introduction to Simple Cryptosystems. Cryptanalysis. Stream cyphers and Block cyphers. Multiple Encryption. Hash Functions. Public-key cryptography and Discrete Algorithms. Cryptographic Protocols and Applications

Course code	**INS 321**
Course title	**Database Security and Auditing**
Weight	

Learning Outcomes	At the end of the course the students should be able to: 1. describe the components of a database system and give examples of their use; 2. describe the differences between relational and semi-structured data models; 3. explain and demonstrate the concepts of entity integrity constraint and referential integrity constraint; 4. apply queries, query optimisations and functional dependencies in relational databases; 5. describe properties of normal forms and explain the impact of normalisation on the efficiency of database operations;
	6. describe database security and integrity issues and their importance in database design; and 7. explain the concepts of concurrency control and recovery mechanisms in databases.
Course content	Information Management Concepts. Information storage & retrieval. Information management applications. Information capture and representation. Analysis and indexing - search, retrieval, information privacy. Integrity and security. Scalability, Efficiency and Effectiveness. Introduction to database systems. Components of database systems. DBMS functions. Database architecture and data independence. Database query language. Conceptual models. Relational data models. Semi-structured data models. Relational theory and languages. Database Design. Database security and integrity. Introduction to query processing and optimisation. Introduction to concurrency and recovery. Lab work: Practical exercise on information representation, capture, storage and retrieval. Learn how to analyse data and index for easy searching and indexing. Practical in creating database files and models. How to create and use various database designs. How to

	query the created database. Methods of concurrency and recovery in databases. Learn how to secure the database.
Course code	**INS 387**
Course title	**Information Systems Innovation and New Technologies**
Weight	(2 Units C: LH 30)

Learning Outcomes	At the end of this course, students should be able to: 1. explain business models; 2. identify some entrepreneurial opportunities available in IT; 3. describe business plan and business startup process; 4. explain business feasibility and strategy; 5. explain marketing strategies; and 6. discuss business ethics and legal issues.
Course content	Fundamental concepts of innovation and business ideas in general. Product development. Business leadership. Digital marketing. Entrepreneurial opportunities in IT. Legal issues and Business ethics. New venture creation process. Business feasibility planning. Market research. Business strategy. Business models and Business plans. Technical presentations. Report on a successful entrepreneurial outfit.

Course code	**COM 321**
Course title	**Internet of Things**
Weight	3 Units C LH 45
Learning Outcomes	At the end of this course, you should be able to: 1. Identify various application areas of IoT

	2. Identify the vulnerabilities and attacks in IoT 3. Build a countermeasure against the vulnerability 4. Identify opportunities in IoT
Course content	Introduction to Internet of Things (IoT). Building Blocks of IoT. Security Considerations Using IoT. Internet of Everything (IoE). Opportunities with IoT. Internet of Everything (IoE)

Course code	**COM 302**
Course title	**Data Structures & Algorithms**
Weight	(3 Units C: LH 30, PH 45)
Learning Outcomes	At the end of this Course, students should be able to: 1. discuss the appropriate use of built-in data structures; 2. apply object-oriented concepts (inheritance, polymorphism, design patterns, etc.) in software design; 3. implement various data structures and their algorithms, and apply them in implementing simple applications; 4. choose the appropriate data structure for modelling a given problem; 5. analyse simple algorithms and determine their efficiency using big-O notation; and 6. apply the knowledge of data structures to other application domains like data compression and memory management

Course content	Primitive types, Arrays, Records Strings and String processing, Data representation in memory, Stack and Heap allocation, Queues, TREES. Implementation Strategies for stack, queues, trees. Run time Storage management; Pointers and References, linked structures. Lab work: Writing C+ /C++ functions to perform practical exercises and implement using the algorithms on arrays, records, string processing, queues, trees, pointers and linked structures.

Course code	**COM 312**
Course title	**Artificial Intelligence**
Weight	(2 Units C: LH 15; PH 45)

Learning Outcomes	At the end of this course, students should be able to: 1. explain AI fundamentals, concepts, goals, types, techniques, branches, applications, AI technology and tools 2. discuss intelligent agents, their performance, examples, faculties, environment and architectures, and determine the characteristics of a given problem that an intelligent system must solve; 3. describe the Turing test and the "Chinese Room" thought experiment, and differentiate between the concepts of optimal reasoning/behaviour and human-like reasoning/behaviour; 4. describe the role of heuristics and the trade-offs among completeness, optimality, time complexity, and space complexity; 5. analyse the types of search and their applications in AI and describe the problem of combinatorial explosion of search space and its consequences; 6. demonstrate knowledge representation, semantic network and frames along with their applicable uses; 7. practice Natural Language Processing, translate a natural language (e.g., English) sentence into a predicate logic statement, convert a logic statement into clause form, apply resolution to a set of logic statements to answer a query; and 8. analyse programming languages for AI and expert systems technology, and employ application domains of AI.
Course content	Overview of Artificial Intelligence. History of AI. Goals of AI. AI Technique. Types of AI. Branches and applications of AI. Advantages and Disadvantages. Introduction to Intelligent Agents. Agent Performance, Examples of Agents, Agent Faculties, Rationality, Agent Environment. Agent Architectures. Search. General Classes of AI Search Algorithm Problems. Problem Solving by Search. Types of AI Search Techniques and Strategies. Introduction to the types of problems and techniques in AI. Problem-Solving methods. Major structures used in AI programmes. Knowledge Representation. KR and Reasoning Challenges. KR Languages. Knowledge representation techniques such as predicate logic, non-monotonic logic, and probabilistic reasoning. Semantic Network - types of relationships,

	semantic network inheritance, types and components. Introduction to Frames. Natural Language Processing (NLP). Introduction to natural language understanding and various syntactic and semantic structures. Introduction to Expert Systems - characteristics, components, types, requirements, technology, development. Programming Languages for AI. Introduction to computer image recognition.

Course code	**SIW 300**
Course title	**SIWES II**
Weight	**3**
Learning Outcomes	At the end of the course, the students should be able to: 1. appreciate the realities of the computing industry beyond the walls of the University, through an attachment with an organisation in the computing industry; and 2. apply the skills and knowledge they acquired in class towards solving real problems in actual working environments.
Course content	Requires 3 months of Industrial Training after the completion of 300 Level. Students' experience will be documented and presented in a Seminar.

Course code	**GST 312**
Course title	**Peace and Conflict Resolution**
Weight	**3**

Learning Outcomes	At the end of the course, students should be able to 1. Analyse the concepts of peace, conflict and security; 2. List major forms, types and root causes of conflict and violence; 3. Differentiate between conflict and terrorism; 4. Enumerate security and peace-building strategies; and 5. Describe the roles of international organisations, media and traditional institutions in peace-building 6. Explain the relationship between peace, conflict and security. 7. Analyse the different theories of conflict and conflict resolution. 8. Apply conflict resolution skills to real-world situations. 9. Evaluate the effectiveness of different peace-building strategies. 10. Develop a personal commitment to peace and conflict resolution.
Course content	Introduction To Peace And Conflict Resolution. Conflict Analysis. Causes & Types Of Conflict. Root Causes Of Conflict And Violence In Africa. Selected Conflict Case Studies. Conflict Transformation. Humanitarian Intervention. Peace Mediation And Peacekeeping. Agents Of Conflict Resolution. Roles Of International Organisations In Conflict Resolution

Course code	**ENT 312**
Course title	**Venture Creation**
Weight	**(2 Units C: LH 15; PH 45)**

Learning Outcomes	At the end of this course, students, through case study and practical approaches, should be able to: 1. describe the key steps in venture creation; 2. spot opportunities in problems and in high potential sectors regardless of geographical location; 3. state how original products, ideas, and concepts are developed; 4. develop business concept for further incubation or pitching for funding; 5. identify key sources of entrepreneurial finance; 6. implement the requirements for establishing and managing micro and small enterprises; 7. conduct entrepreneurial marketing and e-commerce; 8. apply a wide variety of emerging technological solutions to entrepreneurship; and 9. appreciate why ventures fail due to lack of planning and poor implementation.

Course content	Opportunity Identification (Sources of business opportunities in Nigeria, Environmental scanning, Demand and supply gap/unmet needs/market gaps/market research, Unutilised resources, Social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, microfinance, personal savings, small business investment organisations, and business plan competition). Entrepreneurial marketing and e-commerce (Principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, e-commerce business models and successful e-commerce companies). Small business management/family business: Leadership & Management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business

	their closure properties (union, intersection, complementation, concatenation, Kleene star). Nonregular languages and the Pumping Lemma for Regular Languages. Context-free grammars CFG and Context-free languages CFL . The Pushdown Automata PDA . Equivalence of CFG and PDA. Closure properties of Context-free languages. Non Context-free languages and the Pumping Lemma for Context-free languages. Turing machines. Recognisable and decidable languages. Closure properties of recognizable and decidable languages. Diagonalization, Undecidability and Unrecognisability. Time complexity, complexity class P, class NP.
Course code	**COM 322**
Course title	**Computer Science Innovation and New Technologies**
Weight	**3**
Learning Outcomes	At the end of this course, students should be able to: 1. explain business models; 2. identify some entrepreneurial opportunities available in IT; 3. describe business plan and business startup process; 4. explain business feasibility and strategy; 5. explain marketing strategies; and 6. discuss business ethics and legal issues.
Course content	Fundamental concepts of innovation and business ideas in general. Product development. Business leadership. Digital marketing. Entrepreneurial opportunities in IT. Legal issues and Business ethics. New venture creation process. Business feasibility planning. Market research. Business strategy. Business models and Business plans. Technical presentations. Report on a

	successful entrepreneurial outfit

Course code	**BUA 312**
Course title	**E-Commerce**
Weight	

Learning Outcomes	At the end of the course, students should be able to 1. Explain the basic concepts of e-commerce 2. Identify and differentiate the different types of e-commerce systems and their applications 3. Describe the technologies that support e-commerce 4. Discuss the challenges and opportunities that e-commerce presents to traditional businesses 5. Discuss the benefits and drawbacks of e-commerce platforms for businesses 6. Develop an understanding of the critical strategies for launching and managing a successful e-commerce business 7. Develop a successful e-commerce website 8. Gain experience using e-commerce tools and platforms to apply the acquired knowledge to real-life scenarios 9. Understand the laws and regulations that govern e-commerce transactions and privacy. 10. Analyse the ethical and social responsibilities of e-commerce practices 11. Use marketing principles and strategies that are specific to e-commerce, such as digital marketing and customer targeting 12. Develop and nurture communication and collaboration skills that are essential for e-commerce teams and stakeholders 13. Develop problem-solving skills to address common challenges and issues in e-commerce operations
Course content	Introduction to Internet-based business models. Types of e-commerce systems, business and revenue models, drivers and benefits of e-commerce systems. Virtual value chains. Principles of

	e-commerce. Development of e-commerce. E-commerce management. Use of information systems. Knowledge management strategies. E-marketing. Ethical, social and legal aspects of e-commerce

Course code	**INS 316**
Course title	**Principles of information security**
Weight	
Learning Outcomes	At the end of this training, students should be able to: 1. Define the principles and importance of information security in various contexts. 2. Establish and implement information security governance and risk management practices. 3. Design and manage access controls, identity management, and authentication mechanisms. 4. Implement network security measures, including firewalls, intrusion detection, and VPNs. 5. Understand security architecture, including secure system and application design principles. 6. Manage information security operations, incident response, and continuous improvement. 7. Implement physical and environmental security controls and practices.
Course content	Introduction to Information Security. Information Security Governance and Risk Management. Access Controls and Identity Management. Network Security. Security Architecture and Design. Information Security Operations. Physical and Environmental Security. Legal, Ethical, and Professional Issues in Information Security. Security Testing and Evaluation. Business Continuity and Disaster Recovery Planning. Security in the Cloud.

400 Level Courses

Course code	**TRP 401**
Course title	**Technical Report Writing**
Weight	(3 Units C: LH 45)
Learning Outcomes	At the end of the course, students should be able to: 1. describe research, types, approaches, significance of research, research methods, research process, criteria and strategy for good research; 2. discuss the principles of scientific research, scientific investigation, problem formulation, and technique of the research problem; 3. describe the various elicitation methods; 4. develop appropriate data collection instruments; 5. conduct the literature review process; and 6. prepare briefs as well as technical reports and know how to cite referenced works and prepare references and bibliography.
Course content	Foundations of Research. Types of Research. Research Approaches. Significance of Research. Research Methods versus Methodology. Research Process. Criteria and Strategy for Good Research. Principles of Scientific Research. Scientific investigation. Problem Formulation and Its Techniques. Developing Research Proposal and Research Plan. Formulation of Research Questions and Hypothesis Testing. Developing Research Proposal and Research Plan. Literature Review. Procedure for Reviewing Related Relevant Studies. Methods for Collection of Primary and Secondary Data. Elicitation Techniques - Questionnaires, Interviewing, Ethnography, etc. Guidelines for Constructing Data Instruments. Methods of AnalysingData in Computing and Related Disciplines.System Design: Architectural design, input design, process design, output design. Use case analysis, sequence diagram, activity diagram, deployment diagram, etc.Types of Reports. Technical Report Writing. Layout and Mechanics of Writing a Research Report. Standard Techniques for

	Research Documentation. Interpretation and Presentation of Results. How to Cite Referenced Works and Prepare References and Bibliography.

Course code	**PRO 401**
Course title	**Project Management**
Weight	**3**
Learning Outcomes	At the end of this course, students should be able to: 1. describe project management planning; 2. describe project scheduling; 3. explain management of project resources; 4. discuss project procurement, monitoring and execution; and 5. explain project communication and time management.

Course content	Introduction to Project Management. The Project Management Lifecycle: Project management and systems development or acquisition. The project management context. Technology and techniques to support the project management lifecycle, and Project management processes. Managing Project Teams: Project team planning, motivating team members, Leadership, power and conflict in project teams, and managing global project teams. Managing project communication and enhancing team communication. Project Initiation and Planning. Managing Project Scope: Project initiation, how organisations choose projects, Activities, and Developing the project charter. Managing Project Scheduling: Common problems in project scheduling, and Techniques for project scheduling. Managing Project Resources: Types of resources (human, capital, time), and Techniques for managing resources. Project quality and tools to manage project quality. Managing project risk and tools for managing project risk. Managing Project Procurement: Alternatives to systems development, External acquisition, Outsourcing-domestic and offshore. Steps in the procurement process, and managing the

	procurement process. Project Execution, Control and Closure: Managing project execution, monitoring progress and managing change. Documentation and communication, and Common problems in project execution. Managing Project Control and Closure: Obtaining information, Cost control, Change control, administrative closure, Personnel closure, Contractual closure and Project auditing.
Course code	**SDP 411**
Course title	**Design Project**
Weight	**(3 Units C: PH 135)**
Learning Outcomes	At the end of this course, students should be able to: 1. identify a researchable project topic in Data Science; 2. search and review literature pertinent to identified problem statements; 3. acknowledge and reference sources of information used in the research report; 4. conceptualise and design a research methodology to address an identified problem; 5. determine tools for analysing data collected based on research objectives; 6. write a coherent proposal on the research project to be conducted; and 7. orally present the written project proposal
Course content	An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in Data Science carried out under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed.

Course code	INS 471
Course title	Advanced Databases
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of this course, students should be able to: 1. explain the principles and best practices of managing data with efficiency and effectiveness; 2. demonstrate knowledge of SQL and NoSQL; 3. explain data warehouse concepts, methodologies and tools; and 4. explain data mining architecture and applications.
Course content	Rational Databases: Mapping conceptual schema to relational schema; Database Query Languages (SQL) and NoSQL, Concept of functional dependencies & multi-valued dependencies. Transaction processing; distributed databases, XML and semantic Web. Data warehousing. Introduction to data science. Introduction to Data Warehouse, OLTP Systems; Differences between OLTP Systems and Data Warehouse: Characteristics of Data Warehouse; Functionality of Data Warehouse: Advantages and Applications of Data Warehouse. Advantages, Applications: Top- Down and Bottom-Up Development Methodology: Tools for Data warehouse development: Data Warehouse Types. Introduction: Scope of Data Mining: What is Data Mining. How Data Mining Works, Predictive Modelling: Data Mining and Data Warehousing: Architecture for Data Mining: Profitable Applications: Data Mining Tools.

	Lab work: Practical exercises on basic R commands and data structures for manipulating data; how to read data from multiple formats in and out of R, using loops, conditional statements, and functions to automate common data management tasks. Exercises on how to clean and manage multiple complex datasets, manipulate textual data, basic web scraping techniques, for both standard web pages and the Twitter API. Work on techniques and hardware necessary to manage large datasets efficiently. Practical exercise on managing multiple data sets by example; working with text data; converting long- and wide-format data; and dealing with messy data. R Programming Fundamentals for data I/O and packages, looping and conditional statements, and functions.

Course code	COM 411
Course title	Distributed and Cloud Computing
Weight	3 Units C PH 135
Learning Outcomes	At the end of this course, students should be able to: 1. review the concept of cloud, cloud computing, and benefits of the cloud and knowledge of cloud-enabling technologies, virtualisation and multi-tenanting; 2. describe cloud services and service-oriented architectures, and examine the cloud reference model and cloud service models such as IaaS, PaaS and SaaS; 3. state the cloud deployment models of Public, Private, Hybrid and Community clouds and express how to build a cloud, the open standards and open source cloud

	management tools, architectural best practices and how to design for the cloud; 4. discuss the security in the cloud and how to efficiently secure your cloud, security for cloud computing; 5. apply the economics of the cloud, costs and payment models, have knowledge of when to use the cloud, cloud strategy, standards and the future; 6. analyse data centres, servers, data storage, data centre networking and virtualisation, cloud cube model, cloud threats, threat mitigation, cloud and security risks, real world issues with cloud computing, and cloud security alliance; and 7. distinguish the National Institute of Standards and Technology, Information Assurance Framework, Cloud Audit, Cloud Management Audit/Assurance Programme, Cloud Business Continuity Planning for secured and effective management of the cloud.
Course content	Introduction to cloud computing, cloud computing vendors, cloud computing threats, cloud reference model. Cloud-enabling technologies. Services, Service-Oriented Architectures. Cloud service models. Cloud deployment models. Introduction to data centres: servers, data storage, networking and virtualisation. Data centre networking. Introduction to server virtualisation software: VMware VSphere. Virtual machine management: configuration, placement and resource allocation. Power efficiency in virtual data centres. Fault tolerance in virtual data centres. The cloud cube model and security for cloud computing. Security in the cloud. Cloud threats, threat mitigation and security risks. Real world issues with cloud computing. Cloud security alliance. National Institute of Standards and Technology, Information Assurance Framework. Cloud audit. Cloud management audit/assurance programme, Cloud business

	continuity planning. Building a cloud. Architectural best practices: Designing for the cloud. Economics of the cloud. Cloud strategy. Cloud standards and the future. Security of the cloud.
Course code	**INS 421**
Course title	**Information Technology for Development**
Weight	(3 Units E: LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the role of information technology in addressing development challenges. 2. Evaluate the impact of ICT infrastructure and connectivity on global development. 3. Analyze the applications of IT in health, education, agriculture, and rural development. 4. Examine the role of e-Government in public service delivery and governance. 5. Explore the concept of social entrepreneurship in leveraging IT for social impact. 6. Apply data analytics and decision support tools in the context of IT4D. 7. Assess cybersecurity and privacy considerations in IT4D initiatives. 8. Evaluate the sustainability and impact of IT4D projects. 9. Apply strategies for implementing and managing IT4D projects. 10. Demonstrate practical skills through a capstone project focused on IT4D implementation.

Course content	Introduction to Information Technology for Development (IT4D). ICT Infrastructure and Connectivity. Applications of IT in Health and Education. E-Government and Public Service Delivery. IT4D in Agriculture and Rural Development. Social Entrepreneurship and IT4D. Data, Analytics, and Decision Support. Cybersecurity and Privacy in IT4D. Sustainability and Impact Assessment

Course code	**INS 423**
Course title	**Information Technology and Business Analytics**
Weight	(3 Units E: LH 45)
Learning Outcomes	1. Understand the role of information technology and business analytics in organizational strategy. 2. Analyze and design information systems to support business processes. 3. Apply business intelligence concepts and data warehousing techniques. 4. Utilize data analytics techniques for descriptive and predictive analysis. 5. Demonstrate proficiency in big data technologies and their applications. 6. Apply machine learning algorithms for business applications. 7. Analyze and optimize business processes using process analytics. 8. Design and implement decision support systems for organizational decision-making. 9. Apply business analytics in marketing and finance contexts. 10. Demonstrate practical skills through a capstone project focused on business analytics implementation.

Course content	Introduction to Information Technology and Business Analytics. Foundations of Information Systems. Business Intelligence and Data Warehousing. Data Analytics Techniques. Big Data Technologies. Machine Learning for Business. Business Process Analytics. Decision Support Systems. Business Analytics in Marketing and Finance.

Course code	**INS 425**
Course title	**Database Administration**
Weight	3 Units C LH 45
Learning Outcomes	At the end of the course, students should be able to: 1. Understand the fundamentals of Database Management Systems and their role in information management. 2. Design relational databases using Entity-Relationship modeling and normalization techniques. 3. Write advanced SQL queries and utilize stored procedures for data manipulation. 4. Implement security measures and access controls for database protection. 5. Develop data backup and recovery strategies for database integrity and continuity. 6. Perform database performance tuning through optimization techniques. 7. Design and implement data warehousing solutions for business intelligence. 8. Evaluate and implement NoSQL databases based on specific use cases. 9. Understand the impact of cloud computing on database management and implement cloud database solutions. 10. Apply database administration skills through a capstone project focused on implementation, optimization, and security.
Course content	Introduction to Database Management Systems (DBMS). Relational Database Design. SQL and Database Querying. Database Security and Authorization. Data Backup and Recovery. Database Performance Tuning. Data Warehousing and Business Intelligence. NoSQL Databases. Cloud Database Management.

Course code	**COM 423**
Course title	**Mobile Application Development**
Weight	**2**
Learning Outcomes	At the end of the course the students should be able to: 1. identify the basic knowledge on mobile application environment and technology; 2. explain the concepts and processes of mobile application development; 3. discuss design and development issues specific to mobile applications; 4. design and develop mobile applications, using development tools and environments; 5. evaluate the performance of a mobile application and give its result; and 6. appreciate perspectives of mobile applications and their impact.

Course content	Introduction to developing mobile applications. Mobile operating systems capabilities, application architecture, and major components, such as activities, services, broadcast receivers, etc. Development of interactive applications using widget libraries, web-based services. Basic concepts of 2D graphics and animation. An SQL database engine, and multithreading. Multiplatform mobile application development. Mobile application basics and features; Android application basics, UI design. Data storage; networking application design. Advanced application design (sensors, camera, GPS, Audio, etc.), graphics and games, web-

	based hybrid application design. Design and implement a simple mobile application for a given mobile platform. Metrics and methods to evaluate the performance of mobile applications. Mobile application perspectives and impact. Lab Work: Demonstration of a Simple Mobile Application. Design and Development of interactive mobile applications. Demonstration of multiplatform mobile application development. Development of Android applications including UI design and data storage design. Demonstration of advanced mobile application design. Illustration of metrics for measuring the performance of mobile applications
Course code	**COM 421**
Course title	**Computer Graphics and Visualization**
Weight	**(3 Units E: PH 45)**
Learning Outcomes	On completing this unit, you would be able to: 1. Explain the various application areas of computer graphics 2. Understand the elements of a Graphic system. 3. Explain Graphics processing unit and its various forms
Course content	Introduction to Computer Graphics and Animation. Transformations, Camera models, Rasterization and Mapping techniques. Hierarchical Modeling and Animation. Curves and surfaces, image and the human visual system. Ray tracing, illumination algorithms and GPGPU.

Course code	**DTS 423**
Course title	**Machine Learning with Deep Learning**
Weight	**(3 Units E: LH 45)**
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental principles and applications of machine learning and deep learning. 2. Implement and train neural networks for various tasks using TensorFlow and PyTorch. 3. Develop and deploy convolutional neural networks (CNNs) for image recognition. 4. Apply recurrent neural networks (RNNs) for sequential data analysis and natural language processing. 5. Create generative adversarial networks (GANs) for image generation and data synthesis. 6. Implement autoencoders and variational autoencoders (VAEs) for unsupervised learning tasks. 7. Apply transfer learning techniques and deploy deep learning models in real-world scenarios. 8. Recognize and address ethical considerations and bias in machine learning models. 9. Explore advanced topics such as reinforcement learning, quantum machine learning, and explainable AI. 10. Demonstrate practical skills through a capstone project, solving a real-world problem using deep learning techniques.

Course content	Introduction to Machine Learning. Convolutional Neural Networks (CNNs). Recurrent Neural Networks (RNNs). Generative Adversarial Networks (GANs). Autoencoders and Variational Autoencoders (VAEs). Transfer Learning and Model Deployment. Ethics and Bias in Machine Learning. Advanced Topics in Deep Learning.
Course code	**SDP 412**
Course title	**Design Project**
Weight	(3 Units C: PH 135)
Learning Outcomes	At the end of this course, students should be able to: 1. identify a researchable project topic in Data Science; 2. search and review literature pertinent to identified problem statements; 3. acknowledge and reference sources of information used in the research report; 4. conceptualise and design a research methodology to address an identified problem; 5. determine tools for analysing data collected based on research objectives; 6. write a coherent proposal on the research project to be conducted; and 7. orally present the written project proposal.

Course content	An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in Data Science carried out under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the

	project, estimated schedule of completion, and computer resources needed.
Course Code	**COM 402**
Course Title	**Design & Analysis of Algorithms**
Weight	
Learning Outcomes	By the end of this course, students should be able to: ● Understand and Define Algorithms ● Apply Algorithmic Strategies ● Integrate Data Structures and Algorithms ● Utilize Advanced Algorithmic Techniques ● Analyze the time and space complexity of algorithms ● Implement heuristics to solve complex problems. ● Apply learned algorithms to solve real-world problems. ● Implement and analyze algorithms through hands-on projects.
Course Content	Understanding Fundamental Concepts. Algorithmic Problem Solving. Algorithm Design. Algorithm Analysis. Data Structures Integration. Optimization Techniques. Algorithmic Paradigms. Practical Implementation. Algorithmic Problem Classification. Critical Thinking and Analysis
Course Code	**COM 404**
Course Title	**Software Engineering Professional Ethics**
Weight	

Learning Outcomes	● Identify key ethical principles applicable to software engineering. ● Develop critical thinking skills in evaluating ethical dilemmas and proposing ethical solutions. ● Assess the social and global impact of software systems. ● Consider ethical implications related to accessibility, inclusivity, and environmental sustainability. ● Explore case studies highlighting positive and negative societal impacts of software. ● Understand the importance of confidentiality and privacy in software development. ● Implement measures to protect sensitive information in software systems. ● Analyze the ethical considerations related to data privacy and security.
Course Content	Understanding Ethical Principles. Application of Ethical Decision-Making. Compliance with Codes of Conduct. Responsibility to Stakeholders. Social and Global Impact. Confidentiality and Privacy. Professional Integrity and Conduct. Communication and Collaboration. Legal and Regulatory Compliance. Reflection and Continuous Improvement
Course Code	**CYS 412**
Course Title	**Deep and Dark Web Security**
Weight	(2 Units 2: LH 30)
Learning Outcomes	At the end of this course, students should be able to: 1. review Deep and Dark web terminologies; 2. describe how to access the Deep web and the Dark web with complete ease and total security;

	3. investigate advanced and famous websites located on the Hidden Web (Deep and Dark Web); 4. plan, trade, buy, sell as well as mining cryptocurrencies; 5. discuss the dangers as well as precautions to be taken care of while surfing the Web, and how to use Darknet E-mail services; 6. appraise how to anonymously access the Darknet and TOR hidden services (onion services), and how to enter the dark web while staying safe and avoid the bad side of the dark web; and 7. report on the best sites to visit while on the Dark web and Deep web.
Course Content	Dark web, deep web, clear net. Tor Onion, Silk Road. How to get on the dark web. Users of dark and deep web. Invisible Web Search Engines. Privacy and anonymity as core values of the darknet. Decentralisation on the dark web. Accessing the Deep web and the Dark web through the TOR browser. Web security. Cryptocurrencies. Overview on Dark Web and Deep Web. The Hidden side/area of the web. Deep/Dark Web Anonymity, TOR, Hidden services, TAILS, Web Security, Cryptocurrencies. Crypto Trading and Cryptomining. Cryptocurrencies, Anonymity & Security. How to install a VPN, and adequate browsers like Chrome, Opera, or Firefox with tracking technologies. How Does the Dark Web Work? Reasons for Accessing the Dark Web. Security issues of Dark and Deep web. How to use the Tor over VPN method - Session logs storage. Encryption of traffic. Protection against malicious Tor exit nodes. How to use Tor over VPN - bypass blocked Tor nodes, ISP visibility in accessing onion content, susceptible to end-to-end timing attacks. Tor alternatives such as I2P, Matrix.org, Orbot, Globus Secure Browser, Comodo Ice Dragon and FreeNet. Cons and Pros of Tor. Use of virtual machine software. Navigating the Dark Web. The Hidden Wiki as Wikipedia's evil twin. Search engines such as DuckDuckGo, Torch, the triple-W Virtual Library, Uncensored Hidden Wiki, and ParaZite. Commercial services. Email clients. Darknet version of social media and instant messaging - Zuckerberg's Facebook, BlackBook, Torbook, Campfire, MadIRC Chat Server. Safety on the dark web. Inside the dark and deep web. The Best Sites and Services on the Dark Web. Deep web radio. Benefits of

	Deep and Dark web. Cyber Threats and Dangers on the Deep/DarkWeb. How to fight hackers underground. Dark web and Deep web monitoring.
Course Code	**INS 412**
Course Title	**Ethics, Quality and Sustainability in Technological Environments**
Weight	**(2 Units E:LH 45)**
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the ethical considerations and challenges in technological environments. 2. Implement quality assurance practices throughout the technological product lifecycle. 3. Evaluate the principles and practices of sustainable technology development. 4. Apply ethical decision-making frameworks to resolve dilemmas in tech environments. 5. Implement and comply with international quality standards and certifications. 6. Develop and implement Corporate Social Responsibility (CSR) strategies in technology. 7. Demonstrate ethical leadership in managing technology teams and projects. 8. Define and measure quality metrics and key performance indicators (KPIs) in technology. 9. Design and develop sustainable technology solutions with a focus on environmental impact. 10. Integrate ethics, quality, and sustainability concepts in a comprehensive capstone project.
Course Content	Introduction to Ethics in Technology. Understanding ethical considerations in technology. Quality Assurance in Technological Environments. Sustainable Technology Development. Ethical

	Decision-Making in Technology. Quality Standards and Certifications. Corporate Social Responsibility (CSR) in Technology. Ethical Leadership in Technology Management. Quality Metrics and Key Performance Indicators (KPIs). Sustainable Technology Practices. Capstone Project: Integrating Ethics, Quality, and Sustainability.
Course Code	**COM 412**
Course Title	**Data Mining**
Weight	3 Units E LH 45
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Define the objectives and processes of data mining. 2. Explore and prepare data for effective mining. 3. Apply various data mining techniques for classification, clustering, and association. 4. Evaluate and validate data mining models using appropriate metrics. 5. Implement advanced data mining techniques, including ensemble methods and deep learning. 6. Analyze big data using distributed data mining architectures. 7. Apply data mining to real-world applications in different industries. 8. Understand ethical and legal considerations in data mining practices. 9. Utilize data mining tools and software for practical applications. 10. Develop and present a comprehensive capstone project applying data mining techniques.
Course Content	Introduction to Data Mining. Data Exploration and Preparation. Data Mining Techniques. Evaluation and Validation. Advanced Data Mining Techniques. Big Data and Distributed Data Mining. Real-World Applications of Data Mining. Ethical and Legal Issues in Data Mining. Data Mining Tools and Software.

Course Code	**INS 422**
Course Title	**Database Analysis and Design**
Weight	(3 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand fundamental concepts and principles of database management. 2. Develop Entity-Relationship Diagrams (ERD) for conceptual database modeling. 3. Design and implement relational databases, ensuring normalization. 4. Use SQL for querying, updating, and managing relational databases. 5. Apply advanced database design techniques for complex scenarios. 6. Manage transactions and ensure data integrity in database systems. 7. Implement security measures and access controls in databases. 8. Explore data warehousing concepts and data mining techniques. 9. Perform database performance tuning and optimization. 10. Execute a comprehensive database design and implementation project, including documentation and presentation.
Course Content	Introduction to Database Concepts. Entity-Relationship Modeling (ERD). Relational Database Design SQL for Database Design. Advanced Database Design Techniques. Transaction Management and Concurrency Control. Database Security and Integrity. Data Warehousing and Data Mining. Database Performance Tuning.

Course Code	**INS 424**
Course Title	**Information Resource Management**
Weight	(3 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental concepts and principles of Information Resource Management. 2. Develop and implement information governance and compliance strategies. 3. Apply Information Lifecycle Management (ILM) principles to manage data effectively. 4. Implement and manage data and information security measures. 5. Design and implement Knowledge Management (KM) initiatives. 6. Evaluate and optimize information technology infrastructure for IRM. 7. Develop and implement enterprise information architectures. 8. Evaluate, select, and implement information systems and applications. 9. Develop and implement strategic plans for Information Resource Management. 10. Execute a comprehensive Information Resource Management implementation project, including documentation and presentation.
Course Content	Introduction to Information Resource Management (IRM). Information Governance and Compliance. Information Lifecycle Management (ILM). Data and Information Security. Knowledge Management. Information Technology Infrastructure. Enterprise Information Architecture. Information Systems and Applications. Strategic Planning in Information Resource Management.
Course Code	**INS 426**

Course Title	**Mobile Application Development**
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of the course the students should be able to: 1. identify the basic knowledge on mobile application environment and technology; 2. explain the concepts and processes of mobile application development; 3. discuss design and development issues specific to mobile applications; 4. design and develop mobile applications, using development tools and environments; 5. evaluate the performance of a mobile application and give its result; and 6. appreciate perspectives of mobile applications and their impact.
Course Content	Introduction to developing mobile applications. Mobile operating systems capabilities, application architecture, and major components, such as activities, services, broadcast receivers, etc. Development of interactive applications using widget libraries, web-based services. Basic concepts of 2D graphics and animation. An SQL database engine, and multithreading. Multiplatform mobile application development. Mobile application basics and features; Android application basics, UI design. Data storage; networking application design. Advanced application design (sensors, camera, GPS, Audio, etc.), graphics and games, web- based hybrid application design. Design and implement a simple mobile application for a given mobile platform. Metrics and methods to evaluate the performance of mobile applications.

	Mobile application perspectives and impact. Lab Work: Demonstration of a Simple Mobile Application. Design and Development of interactive mobile applications. Demonstration of multiplatform mobile application development. Development of Android applications including UI design and data storage design. Demonstration of advanced mobile application design. Illustration of metrics for measuring the performance of mobile applications
Course Code	**COM 422**
Course Title	**Blockchain Technologies**
Weight	(3 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Understand the fundamental concepts and principles of blockchain technology. 2. Evaluate different types of blockchains and their applications. 3. Analyze and implement various consensus mechanisms in blockchain. 4. Develop and deploy decentralized applications (DApps) on blockchain platforms. 5. Explore permissioned blockchains and assess their use in enterprise settings. 6. Navigate legal, regulatory, and ethical considerations related to blockchain. 7. Address interoperability and scalability challenges in blockchain. 8. Integrate blockchain into existing systems and develop blockchain applications. 9. Examine the role of blockchain in finance, including cryptoeconomics.

	10. Execute a comprehensive blockchain implementation project, including documentation and presentation.
Course Content	Introduction to Blockchain. Cryptocurrencies and Tokens. Blockchain Consensus Mechanisms. Decentralized Applications (DApps). Permissioned Blockchains and Enterprise Use Cases. Regulatory and Ethical Considerations. Interoperability and Scalability. Blockchain Integration and Development. Blockchain in Finance and Cryptoeconomics. Blockchain Implementation.
Course Code	**COM 424**
Course Title	**Web Application Development**
Weight	(2 Units C: LH 15; PH 45)
Learning Outcomes	At the end of the lecture, the students should be able to: 1. design and implement simple client-side and server-side web applications; 2. demonstrate hands-on skills in PHP and Python programming uses open-source software; 3. compare and contrast web programming with general-purpose programming; and 4. develop a fully functioning website and deploy it on a web server.
Course Content	Introduction to framework-based web development using a contemporary language like PHP and ASP.net. Principles of web pages (dynamic and static) and website design. The tool used in web development. Client-side and server-side languages. Creation of interactive, dynamic websites using a common web architecture and object-based database access. Design, implementation, and testing of web-based applications including related software, databases, interfaces, and digital media. Standard object models, and the use of server-side programmes for database and file access; testing, software quality assurance; and the process of publishing Web sites. Hands-on PHP and Python programme using open-source software

	(Apache, PHP, Python, JavaScript, and MySQL). Programming for web development includes control structures, objects, functions, and the use of composite data types. Deploying dynamic content using JavaScript. Designing and developing dynamic web pages and creating, validating, transforming, and formatting data using PHP.
Course Code	**DTS 424**
Course Title	**Statistical Computing with SAS and R**
Weight	(3 Units E:LH 45)
Learning Outcomes	Upon successful completion of the course, students will be able to: 1. Demonstrate proficiency in SAS and R programming languages for statistical computing. 2. Manipulate and preprocess data using SAS and R. 3. Perform descriptive and inferential statistical analyses. 4. Create advanced data visualizations and reports. 5. Conduct time series analysis and interpret results. 6. Analyze longitudinal data using mixed-effects models. 7. Apply survival analysis techniques to relevant data. 8. Understand and work with big data analytics using SAS and R. 9. Integrate statistical computing tools with big data platforms. 10. Execute a comprehensive statistical analysis project using SAS and R, including documentation and presentation.
Course Content	Introduction to Statistical Computing. Basic Data Manipulation in SAS and R. Descriptive Statistics with SAS and R. Inferential Statistics with SAS and R. Advanced Data Visualization in SAS and R. Time Series Analysis. Longitudinal Data Analysis. Survival Analysis. Big Data Analytics with SAS and R.

13.0 Instructional Methods

The instructional method is through the online course materials and hardcopies distributed to students at the Study Centres. Online facilitation is done through Learners Management Systems LMS . Other online fora for instructional delivery include chat, synchronous and asynchronous methods of communication using the LCMS platform and other mobile technologies. The facilitators will be closely monitored by the Head of the Department, the Study Centre Director and Directorate of Learners Support Services DLSS staff to ensure the quality of the services being rendered to the students.

14.0 Quality Assurance

Subject to the Senate's recommendations, the process of developing and adapting all instructional items is seriously monitored internally, so as to ensure quality right from the onset. The instructional items to be developed are subjected to plagiarism checks by the university and they are developed and edited by experts with PhD as a minimum qualification. Besides the 5-year period for the review of instructional items is another opportunity for review as the need arises to ensure the quality of the programme. Facilitators for the various courses are carefully selected from sister Universities nationwide with a minimum qualification of PhD. Finally, the West Midlands Open University policy and procedures for internal course validation follow.

15.0 Evaluation

Evaluation of all the courses would consist of Tutor Marked Assignments
TMAs), Computer Marked Assignments CMA and End of Semester Examinations. The TMA and CMA known as Continuous Assessment CA constitutes 40% of the final score. The End of Semester Examination is 60%

15.1 Tutor-Marked Assessments

As part of the evaluation mechanism, each course would be provided with at least 3 TMAs to be used as part of Continuous Assessments for a course. To qualify to sit for examination therefore, each student must turn in the three TMAs for each of the courses.

15.2 End of Semester Examination

Each course will be examined at the end of the semester. Course lecturers are responsible for the provision of questions and question data banks in the Department. Lecturers of the Department who are experts in the various course areas are responsible for TMAs and final examination question setting using the in-house style provided by the University. Thereafter, the questions would be internally moderated by the HOD and other senior internal staff in the Department before the invitation is sent to an External Assessor for moderation. The external assessor is chosen from other tertiary institutions.

Also, students' projects are moderated zonally using the Project Administration System

PAS .

16.0 Principal Officers of the University

Board Members

XXX

Management

Vice Chancellor - XXX

Registrar - XXX

Librarian - XXX

16.1 Staff of the Department

A. Teaching Staff

S/N	Name of Staff	Rank	Qualification/Specialization/Date Obtained	Role
1.	**Prof. BAALE Abimbola Adebisi**	Professor	PhD Computer Science (Data Mining) LAUTECH, Ogbomoso, Nigeria Year Awarded – 2012	HOD
2.	**Dr. OGUDE Ufuoma Cyril**	Senior Lecturer	**Ph.D.** Computer Science University of Port Harcourt, Nigeria Year Awarded - 2016	

3.	**Dr.Mrs. OLATINWO, Ikeola Suhurat**	Senior Lecturer	PhD Computer Science (Artificial Intelligence) University of Ilorin, kwara Stste Nigeria Year Awarded - 2022	
4.	**FAMUYIWA Kolawole Samuel Abiodun**	Lecturer I	PhD Computer Science (Cyber Security) Caleb University, Imota, Nigeria In View M.Sc Computer Science Caleb University, Imota, Nigeria Year Awarded - 2020	

5.	**ADEPEGBA Solomon Adedeji**	Lecturer II	Ph.D. in View (Computer Science) University of Ibadan **M.Sc.** Computer Science University of Ibadan, Nigeria, Year Awarded - 2023	
6.	**LONGE Folake Adunni**	Lecturer 1	M.Tech Computer Science Federal University of Technology Akure Year Awarded – 2005 Post Graduate Diploma in Education Year Awarded – 2005	

B. Technical Staff

S/N	NAME	QUALIFICATION	SPECIALISATION	RANK

C. Administrative Staff

S/N	NAME	QUALIFICATION	RANK

17.0 Learners' Support

Similar to other students receiving tertiary education, students in Distance Education require various academic and administrative support services from the University. The existing academic support services are from the Directorate of Learner Support Services DLSS that currently coordinates various Study Centres, student Counsellors and Facilitators. The School of Computing on its own, takes steps to enhance Study facilitation by following up on facilities available for its courses in all Study Centres and employ more Facilitators as the need arises.

18.0 Recognition of the Programme

The B.Sc. in Computer Science introduces students to a multifaceted approach to modern technology, encompassing various aspects of software development, system dynamics, and strategic problem-solving. This programme aims to cultivate adept professionals capable of addressing challenges in the ever-evolving digital landscape, including cybersecurity, data privacy, software vulnerabilities, and technological advancements. Our vision is to establish a world-class centre for computer science education, providing high-quality undergraduate and postgraduate programmes that empower graduates to lead in the fast-paced and innovative technology industry with a focus on sustainable practices and ethical considerations. Through collaborative research and community engagement, we strive to make significant contributions to positive advancements in technology and its impact on society, paving the way for a prosperous and technologically-driven future.

19.0 Target Students

As a Computer Science programme offered by an Open University, the B.Sc. in Computer Science is designed to cater to a diverse range of candidates interested in exploring the exciting world of technology and computing. This comprehensive programme attracts a wide array of individuals, including high school graduates seeking to embark on a promising computing career, career changers from various fields, STEM enthusiasts with a passion for problem-solving, women looking to break into the tech industry, aspiring entrepreneurs aiming to drive innovation, IT professionals seeking to advance their

expertise, avid gamers and tech enthusiasts fascinated by game development and artificial intelligence, and lifelong learners with a curiosity for the latest technological advancements. The program's broad applications and constant evolution make it an appealing choice for those with a keen interest in acquiring academic and vocational qualifications in the realm of Computer Science.

Given the high demand and interest in the B.Sc. Computer Science program, prospective learners can look forward to a promising future of gaining extensive knowledge and honing their innate abilities in critical thinking and problem-solving within the realm of technology and computing. The curriculum is designed to equip graduates with the skills to analyse and address socio-economic, political, and developmental challenges. With a focus on fostering knowledge-based professionals, this programme is expected to significantly benefit graduates as they embark on rewarding careers in both the private and public sectors.

20.0 Conclusion

The Computer Science Department is domiciled in the School of Computing at West Midlands Open University. The department seeks to produce job-ready graduates who embody the university’s core values and become truthful, empathetic, and innovative individuals. The Computer Science Department equips students with a diverse skill set, including technological proficiency, leadership, entrepreneurship, and analytical capabilities, preparing them to excel in the rapidly evolving field of computer science and technology. This fosters a generation of adaptable and ethical professionals ready to meet the demands of the digital age.